*Regulation Manual*
*Manuel de régulation*
*Regelungshandbuch*
*Manuale di regolazione*
*Manual de regulación*

# PAC HT
# 12-6 ÷ 18-9

**PRELIMINARY**

**SOFTWARE V5.1**

**English** | Français | Deutsch | Italiano | Español

**Air-water Heat Pump**
**Pompe à Chaleur air-eau**
**Wärmepumpe Luft-Wasser**
**Pompa di Calore aria-acqua**
**Bomba de Calor aire-agua**

12 ↓ 17.9kW

HFC 407C

**UM PAC HT 01-N1GB**
Part number / Code / Teil Nummer / Codice / Código : **3990534GB**
Supersedes / Annule et remplace / Annulliert und ersetzt /
Annulla e sostituisce / Anula y sustituye : **None / Aucun / Keine / Nessuno / Ninguno**

**REGULATION MANUAL** English

MANUEL DE RÉGULATION Français

REGELUNGSHANDBUCH Deutsch

MANUALE DI REGOLAZIONE Italiano

MANUAL DE REGULACIÓN Español

English

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**IN ORDER TO ENSURE THAT APPLIANCE SAFETY PROTECTION SYSTEMS REMAIN ACTIVE (COMPRESSOR SUMP HEATER, ANTI-FREEZING PROTECTION, CIRCULATION PUMP ANTI-SEIZING PROTECTION), WE STRONGLY ADVISE AGAINST SWITCHINGOFF THE POWER SUPPLY TO THE PAC HT WHEN IT IS NOT IN USE FOR HEATING.**

## 1. MANUAL USER GUIDE

**The purpose of this manual is to explain the various functions and possibilities offered by the PAC HT regulation system. The manual also provides a detailed description of all the parameters accessible via the graphic display integrated in the appliance, as well as a few parameters to be set at the time of start-up.**

### 1.1. ICONS

Several different icons are present throughout the document:

**WARNING:** Warns of a risk to proper operation of the PAC HT, of a strong recommendation associated with occupant comfort or energy savings, or of important points of which a good understanding is necessary.

**TIP:** Highlights how a simple parameter setting can offer improved installation performance or make start-up easier.

**NOTE** Attracts the reader's attention to a special point.

### 1.2. MODIFIABLE PARAMETERS

In this document, all the parameters that can be modified via the **PAC HT** display are highlighted in ***bold italic***.

All the menus, screens and associated parameters are listed at the end of this manual with the reference screen, the unit of measurement, and with minimum, maximum and default values.

# 2. MAIN FUNCTIONS

## 2.1. SEMI-GRAPHIC DISPLAY

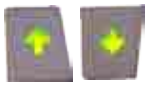
The terminal is a 6-button, 4-line x 20-character LCD model, which can display text in various sizes and icons.

### 2.1.1. KEYPAD

ALARM : When you press the Alarm key (the red bell is apparent if an alarm is active), the first active alarm is displayed on the screen. Use the UP/DOWN keys to view all the active alarms. Press the Alarm key a second time to cancel all alarms that can be cancelled in this manner. Alarms that remain active are still displayed. If no alarm is active, pressing the key returns the system to the "NO ALARM ACTIVE" screen.

ESC : Moves to previous level in the menu arborescence. Press this to change an analogue or integer variable, such as 34.5 for example (as opposed to a digital variable such as Yes/No), to cancel the current change and return to the previous menu. This function is very important if a parameter is changed by mistake.

PROG : From any screen, this key returns to the main menu. Just as the ESCAPE key, this key cancels the current change.

UP/DOWN  : These keys have several functions:

In a menu, they enable you to scroll through the list of available selections.
When the cursor is placed in the top left hand corner of the screen it is possible to scroll through the screens available in this arborescence.
Finally, these keys enable you to change the value of a parameter when the cursor is placed on the parameter in question.

ENTER : On those screens where it is possible to change one or several parameters, the first press on the key moves the cursor to the first parameter on the screen. A second press validates the current parameter and the cursor scrolls to the following parameter until it returns to the upper left hand corner.

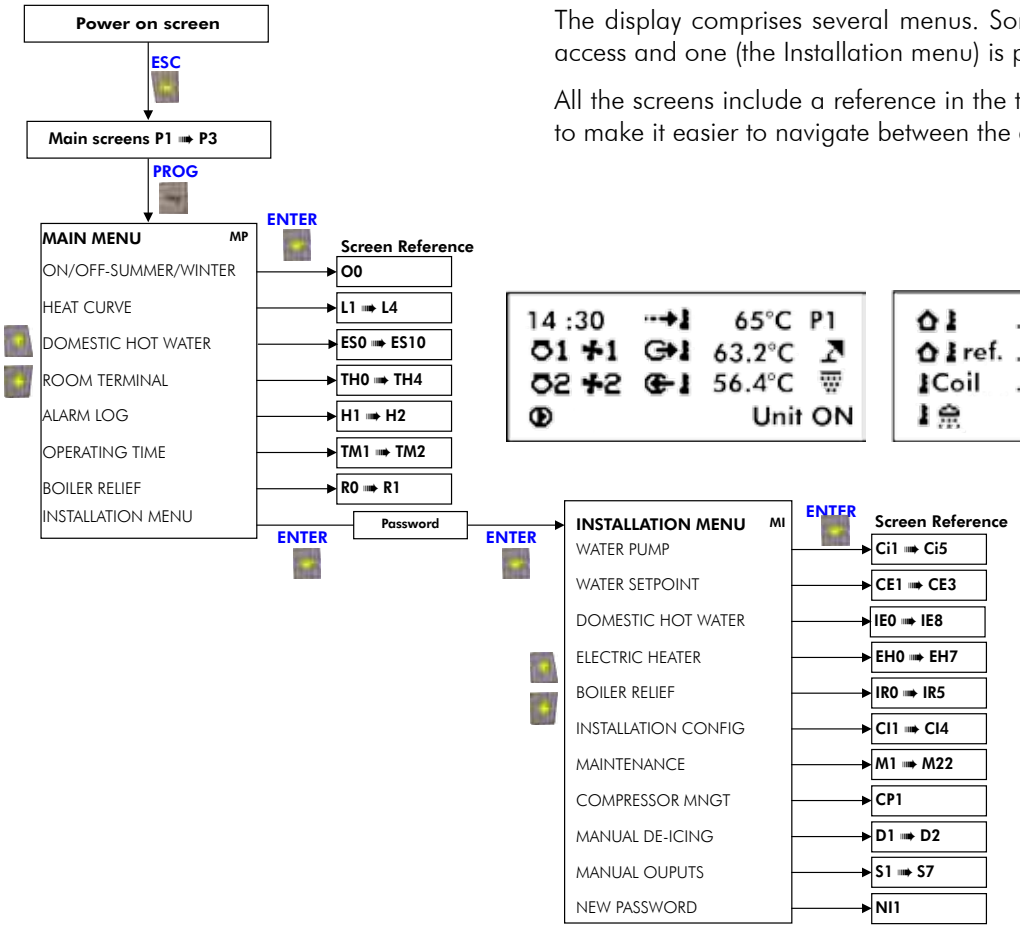
### 2.1.2. BACKLIGHTING

All the screen keys are backlit.

The ALARM key diode lights up when at least one alarm is active. The PROG key is lit when you are in the main menu or in one of its sub-menus. The ESCAPE, UP, DOWN and ENTER keys light up along with the display backlighting.

If no key is pressed during a 5 minute period, the display automatically reverts to the first main screen (P1) and all backlighting is switched off.

## 2.1.3. MENUS



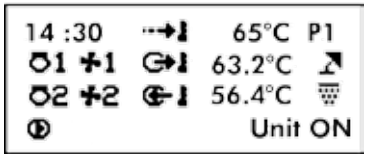

The display comprises several menus. Some have unrestricted access and one (the Installation menu) is password protected.

All the screens include a reference in the top right hand corner to make it easier to navigate between the different menus.

## 2.1.4. ICONS

| | | |
|---|---|---|
| P1 | | Outlet water set temperature, calculated from the heat curve parameters, the outdoor temperature, the ambience set temperature and the variance between the set and the ambience temperature. |
| | 1 | Compressor 1 (large) in operation |
| | 2 | Compressor 2 (small) in operation |
| | +1 | Fan 1 (upper) in operation |
| | +2 | Fan 2 (lower) in operation |
| | | Leaving water temperature |
| | | Entering water temperature |
| | | **PAC HT** in Summer mode |
| | | Flashing: Countdown for de-icing<br>Fixed on: De-icing in progress |
| | | Circulation pump in operation |
| P2 | | Instantaneous outdoor temperature |
| | ref. | Reference outdoor temperature used by the **PAC HT** (upper fan special management) |
| | coil | Outdoor exchanger temperature (used for the de-icing countdown) |
| | | Domestic hot water temperature (when the option is installed) |
| | | **PAC HT** in domestic hot water production mode (flashing) |
| | 1 | Electric heater Stage 1 in operation (flashing) |
| | 2 | Electric heater Stage 2 in operation (flashing) |
| | | Boiler relief in operation (flashing) |

### 2.1.5. STATUS POSSIBLITIES




On screen P1 (lower right-hand corner), the **PAC HT** controller provides real time information on its current status.

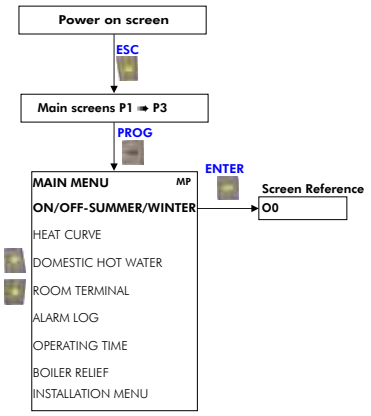
| Status displayed on P1 | Significance |
|---|---|
| No room need | No need in terms of ambience settings (Refer to the § **HEAT CURVE AND ROOM TEMPERATURE MANAGEMENT**, page 11). The **PAC HT** is on standby and is waiting for a demand for heating from the ambience terminal. |
| Waiting comp. | Waiting for compressor timers. The **PAC HT** is awaiting the end of the start-up time delay for a compressor before being able to restart (refer to § **OPERATIONAL TECHNICAL LIMITATIONS** in the Compressor Management section). |
| Waiting water T | Waiting water Temperature. A demand for heating has been received but the leaving water temperature is too high to restart the compressor(s) compared with the water temperature setpoint (calculated by the heat curve). May also appear at the time of taking the outdoor temperature reference. |
| Starting... | The **PAC HT** is in start-up phase. It may be awaiting the end of the time delay on water pump start-up. |
| ON alarm | Only one compressor is operating, while the other is in alarm. |
| Unit ON | The compressor(s) are operating. |
| Alarm stop | The **PAC HT** has been shut down by an alarm (Refer to the § **ALARM LIST AVAILABLE ON THE PAC HT DISPLAY**, page 59) |
| OFF by Contact | The **PAC HT** is completely shut down via the remote ON/OFF digital input (Refer to the § **ON/OFF**, page 7). |
| Room therm. OFF | The **PAC HT** is in forced Summer operating mode (Domestic Hot Water (DHW) production only) via the ambience terminal set to **STANDBY** mode ⏻ (refer to the ambience terminal documentation). |
| OFF by display | The **PAC HT** has been completely shut down via the MAIN OFF (screen O0) on the appliance's display (Refer to the § **ON/OFF**, page 7). |
| freeze protect. | Anti-freeze protection. The **PAC HT** is shut down and the anti-freeze protection has detected an excessively low water temperature, which then activates the anti-freeze protection sequence (Refer to the § **ANTI-FREEZE FUNCTION**, page 43). |
| Anti-seize | Water pump anti-seize function activated (Refer to the § **WATER PUMP MANAGEMENT**, page 41). |
| De-icing | De-icing under way. |
| Initialisation | Initialisation displayed for 5 seconds when the screen lights up after power is switched on to the appliance. |
| Auto. stop | Automatic stop and re-start of the **PAC HT** associated with the compressor oil equalisation protection system. |

## 2.2. ON/OFF, SUMMER/WINTER

### 2.2.1. ON/OFF

The **PAC HT** can be switched to MAIN OFF via the unit display or via one digital input (remote control with independent 24V AC supply, refer to wiring diagrams). In MAIN OFF mode, the appliance provides no regulation functions other than basic protection (anti-freeze, water pump anti-seize and compressor crankcase heaters management). The appliance has to be ON via the display and with the digital input for it to start (apart from in the case of a blocking start-up alarm).

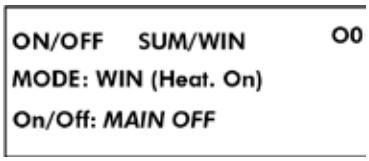
#### 2.2.1.1. PAC HT DISPLAY ON/OFF



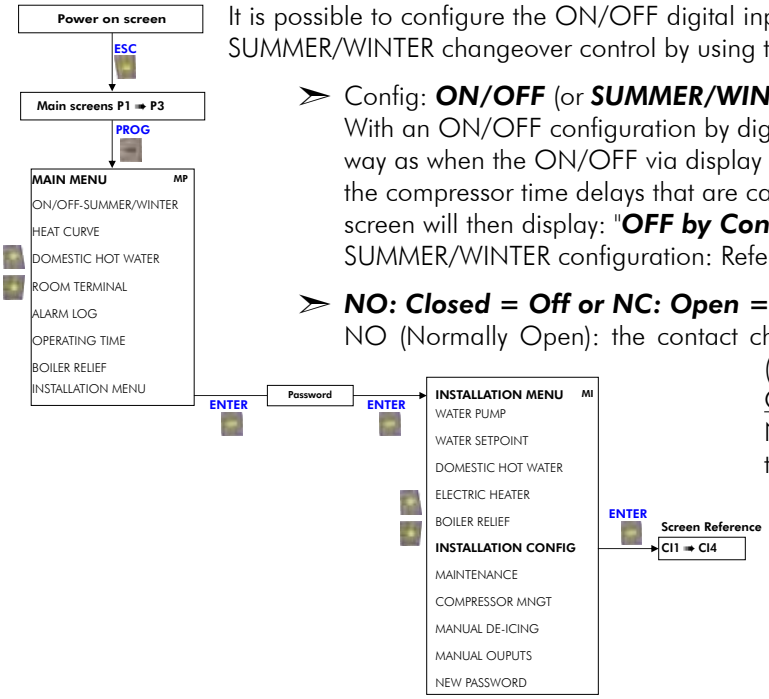

The **PAC HT** may be switched to MAIN OFF from the screen O0.

In this case the following text will be present on the P1:

"**OFF by display**"



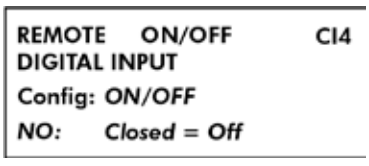

#### 2.2.1.2. REMOTE ON/OFF (INPUT ID9 ON THE J7 CONNECTOR)




It is possible to configure the ON/OFF digital input as the actual ON/OFF control or as the SUMMER/WINTER changeover control by using two parameters on screen CI4 :

➢ Config: ***ON/OFF*** (or ***SUMMER/WINTER***)
With an ON/OFF configuration by digital input, the **PAC HT** acts in the same way as when the ON/OFF via display is used (with the exception of waiting for the compressor time delays that are cancelled in OFF via display). In OFF, the P1 screen will then display: "***OFF by Contact***".
SUMMER/WINTER configuration: Refer to the following paragraph.

➢ ***NO: Closed = Off or NC: Open = Off***
NO (Normally Open): the contact changes to **PAC HT** OFF when it is closed (Default setting, therefore the PAC remains ON if this contact is not wired).
NC (Normally closed): This contact switches the appliance OFF when it is open.




### 2.2.2. SUMMER/WINTER

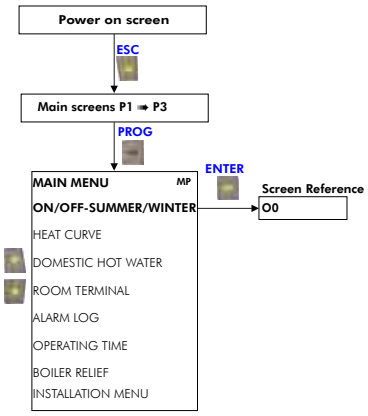
As opposed to the ON/OFF control, the SUMMER/WINTER control enables the Domestic Hot Water function to be maintained when the heating period is over (SUMMER mode). In this case, the water pump also operates in a special manner (Refer to the § **WATER PUMP MANAGEMENT**, page 41). When the appliance is in SUMMER mode, the umbrella pictogram appears on screen P1. To actually be in WINTER mode, the appliance has to be in WINTER mode via the display, the ambience terminal and the digital input. If one of these three is in SUMMER mode, the **PAC HT** will remain in SUMMER mode and will only produce DHW.

### 2.2.2.1. SUMMER/WINTER MODES ON THE ROOM TERMINAL

Refer to the Standby mode ⏻ in the communicating room terminal manual.

Standby mode switches the **PAC HT** into SUMMER mode (heating shut down). This is the easiest way to switch your appliance over to SUMMER mode. However, if the ambience terminal is not connected, switchover has to be performed via the appliance's display or by using the remote input.

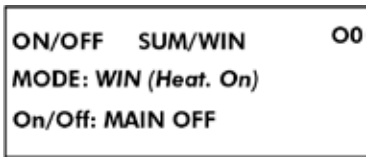
### 2.2.2.2. PAC HT SUMMER/WINTER DISPLAY



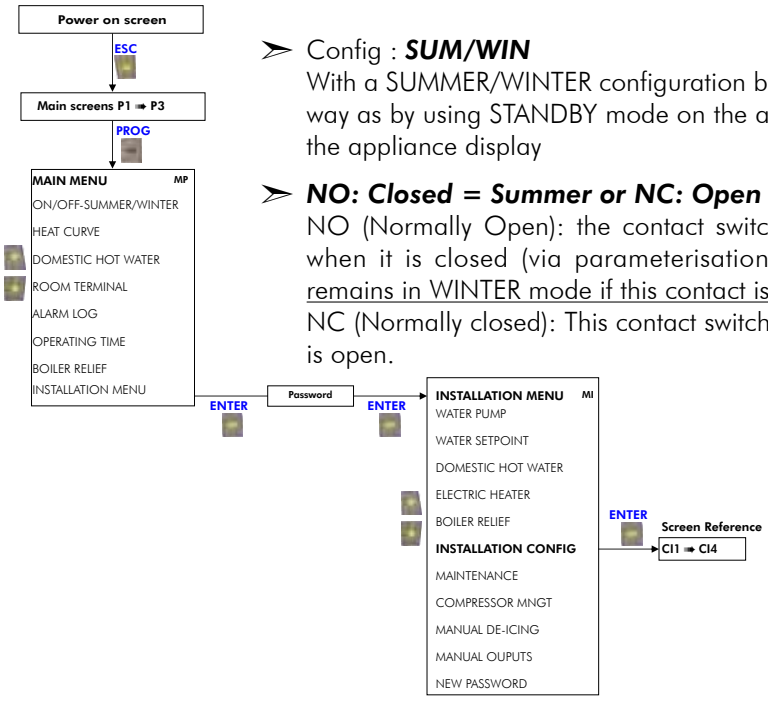

The appliance can be switched to and from SUMMER and WINTER mode from the screen O0.

➢ ***Heat. On*** (in WINTER mode) means that the heating is enabled.

➢ ***Heat. Off*** (in SUMMER mode) means that the heating is shut down.

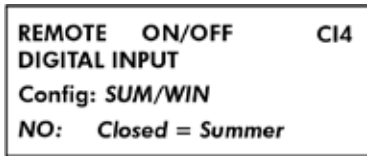



### 2.2.2.3. REMOTE SUMMER/WINTER (INPUT ID9 ON CONNECTOR J7)




➢ Config : ***SUM/WIN***
With a SUMMER/WINTER configuration by digital input, the **PAC HT** acts in the same way as by using STANDBY mode on the ambience terminal, or SUMMER/WINTER on the appliance display

➢ ***NO: Closed = Summer or NC: Open = Winter***
NO (Normally Open): the contact switches the **PAC HT** OFF to SUMMER mode when it is closed (via parameterisation) as a default setting, therefore the PAC remains in WINTER mode if this contact is not wired).
NC (Normally closed): This contact switches the appliance to SUMMER mode when it is open.




### 2.2.3. PEAK ENERGY DAY CONFIGURATION

It is important to configure the ON/OFF (or SUMMER/WINTER) digital input correctly if the **PAC HT** is used in conjunction with a peak energy day electricity contract.

### 2.2.3.1. PEAK ENERGY DAY ONLY, WITHOUT BOILER RELIEF OR DHW PROVIDED BY THE PAC HT

Use the ON/OFF input default parameter settings.

When the peak energy day shuts down the **PAC HT**, the appliance will be closed down completely, with the exception of its own safety protection systems.

#### 2.2.3.2. PEAK HOURS ENERGY SAVINGS WITH BOILER RELIEF BUT WITHOUT DHW PROVIDED BY THE PAC HT

As with the previous case, the ON/OFF input does not require any special configuration. When the Boiler relief option is enabled in the Installation menu, the **PAC HT** will automatically activate the boiler in off-peak hours energy savings mode. Therefore, it is not necessary to connect the off-peak energy savings contact to the boiler.

Refer to the § **BOILER RELIEF**, page 37 for further details.

#### 2.2.3.3. PEAK HOURS ENERGY SAVINGS WITHOUT BOILER RELIEF BUT WITH DHW PROVIDED BY THE PAC HT

##### 2.2.3.3.1. NO PRODUCTION OF DHW DURING PEAK HOURS

In this case, the ON/OFF configuration is perfectly suitable. During peak hours, the PAC will be completely shut down (no Heating or DWH production) and will resume normal operation at the end of the period.

##### 2.2.3.3.2. DHW PRODUCTION DURING PEAK HOURS (PRIORITY PLACED ON DHW COMFORT RATHER THAN ENERGY SAVINGS)

In this case, the appliance must not be OFF when the off-peak hours energy savings contact is activated, or it will no longer provide DHW. Therefore, the remote ON/OFF input must be configured in SUMMER/WINTER mode. During peak hours, the SUMMER mode will shut down the heating, while enabling DHW to be produced as and when required. (This function should be combined with timer settings or the DHW off peak digital input – Refer to the corresponding paragraph in the Domestic Hot Water function description).

#### 2.2.3.4. PEAK HOURS ENERGY SAVINGS WITH BOILER RELIEF AND WITH DHW PROVIDED BY THE PAC HT

In this case, the **PAC HT** can no longer manage the boiler. Therefore, the Boiler relief function must not be activated, and the ON/OFF input should be used, configured in SUMMER/WINTER mode.

The boiler must be managed directly by the off-peak hours energy savings contact. This implies that the boiler must be equipped with a temperature regulation system that is independent of the **PAC HT**.

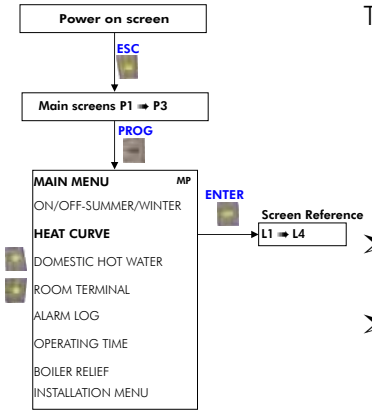
## 2.3. HEAT CURVE, INTERACTION WITH THE ROOM TERMINAL

### 2.3.1. GENERAL DESCRIPTION

The PAC HT continually manages a law governing the temperature of the leaving water pumped into the heating system. In relation to the various parameter settings, the outdoor temperature and indoor ambient conditions in the residence, the appliance will determine the water temperature best adapted to heating needs.

**WE STRONGLY RECOMMEND THE USE OF THE PAC HT HEAT CURVE TO GUARANTEE OPTIMUM PERFORMANCE THROUGHOUT THE YEAR. CANCELLING THE HEAT CURVE CAN LEAD TO SIGNIFICANTLY HIGHER ENERGY CONSUMPTION.**

### 2.3.2. HEAT CURVE IN RELATION TO OUTDOOR TEMPERATURE




The following parameters enable the heat curve to be modified easily:

| HEAT CURVE | L1 |
|---|---|
| Altitude : | 0.0 km |
| Base outd. T. : | -07°C |
| Correction coef. : | 0.8 |

| HEAT CURVE | L2 |
|---|---|
| Heat loss at Base outd. temp.: | 9.9 kW |
| Base water SPT: | 65°C |

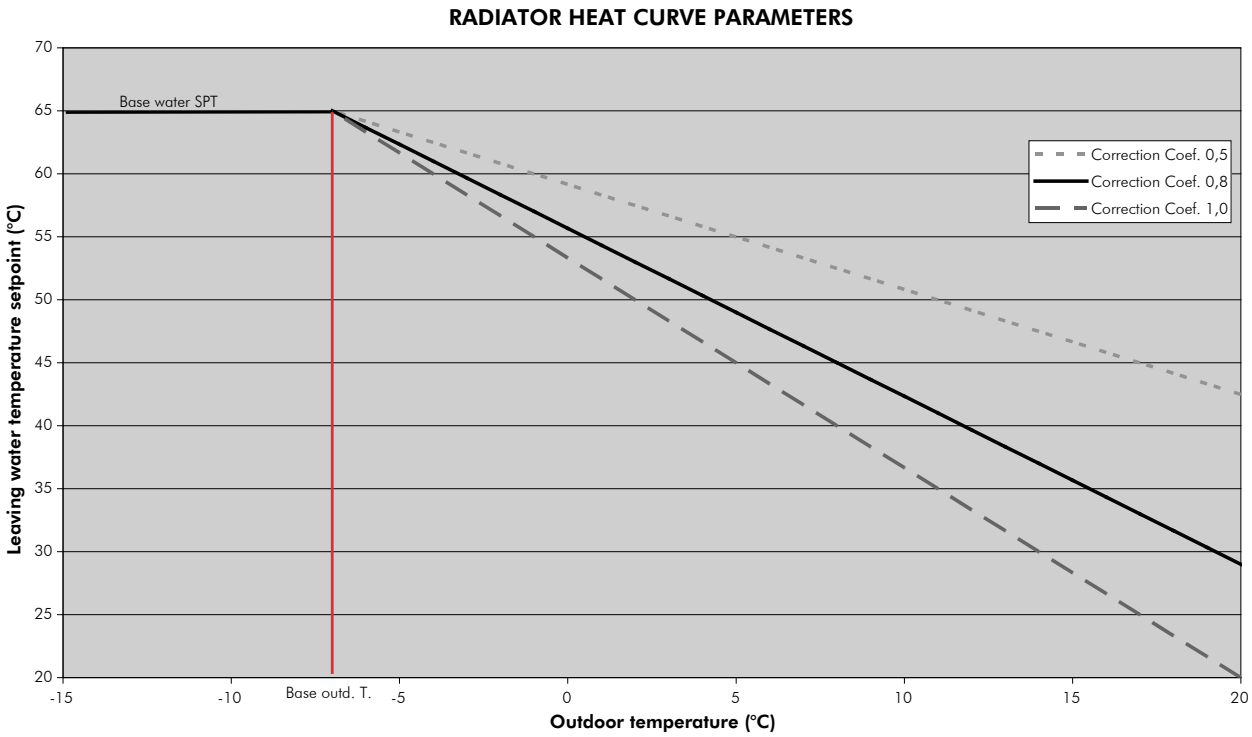
➢ ***Altitude*** (Default setting: 0.0km)
Setting the actual altitude is worthwhile at heights of over 500m.

➢ ***Base outd. T.*** (Default setting: -7°C) The temperature corresponds to the "base" or reference temperature for the region where the **PAC HT** is installed.
It is important to be aware of, and to set, this temperature as it has a significant impact on the heat curve. For example, in France, it may vary from -12°C in the Vosges (Eastern France) to -2°C in the Var (South of France) region.

➢ ***Corrction coef.*** (Default setting: 0.8)
This parameter is a correction coefficient that enables the heat curve to be modified for between-seasons outdoor temperatures. In fact, the parameter changes the slope start point and therefore is initially used to alter the start point when the user observes an abnormally low or high room temperature compared with the set temperature during between-season periods. However, this coefficient has very little influence when outdoor temperatures are negative.

➢ ***Heat loss at base outd. temp*** (Default value depending on the **PAC HT** model, from 9.9kW to 14.9kW)
This capacity in kW corresponds to the residence's estimated heat losses for the given base outdoor temperature (e.g. -7°C) and for an ambient temperature of 20°C. It is preferable not to modify this parameter if the heat loss value is not known.
The maximum value of this parameter changes with the set base temperature as it actually corresponds to the capacity of the **PAC HT** at this same temperature, plus an increase.
If the residence's calculated heat losses exceed the maximum permissible capacity (e.g. 9.9kW on the model 12-6 for a -7°C outdoor temperature), it is highly likely that the appliance installed will not be capable of maintaining an ambient temperature of 20°C at the base outdoor temperature.
This parameter serves primarily to calculate the balance point outdoor temperature for the small compressor, i.e. the outdoor temperature below which the small compressor's capacity is no longer sufficient to increase the ambient temperature (around 6°C outdoor temperature at default heat curve settings). The **PAC HT** will then opt to switch to full capacity operation mode (Refer to the § **COMPRESSOR MANAGEMENT**, page 17).

➢ ***Base water SPT*** (Default setting: 65°C)
This temperature is the desired outlet water temperature in the heating circuit, at the base outdoor temperature and an ambient temperature of 20°C. This temperature can be raised to well over 65°C (90°C maximum) but the **PAC HT** will automatically limit its leaving water temperature to 65°C. It may be worthwhile increasing this value when using the system as a substitute for a hot water boiler (Refer to the corresponding paragraph). This value is automatically adjusted to 35°C when the **PAC HT** is configured for use with floor Heating (Refer to the § **RADIATORS / FLOOR HEATING CONFIGURATION**, page 15).




### 2.3.3. HEAT CURVE AND ROOM TEMPERATURE MANAGEMENT

The heat curve is mainly influenced by the outdoor temperature, but account is also taken of ambient conditions.

#### 2.3.3.1. DECLARED ROOM TERMINAL (DEFAULT)

It is vital for the communicating room terminal to be connected to the **PAC HT** to take advantage from fine and precise management of the room temperature and to ensure optimal heating system performance (Refer to the installation and maintenance manual and to the communicating room terminal for wiring details).

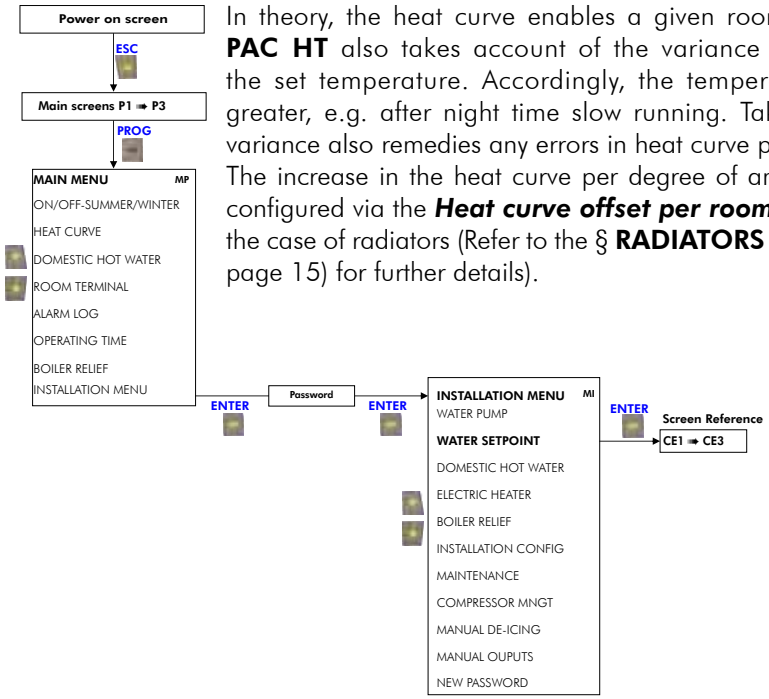
The room terminal continuously sends information about the current temperature and the set room temperature to **PAC HT**, which then calculates the optimal water setpoint in the following manner:

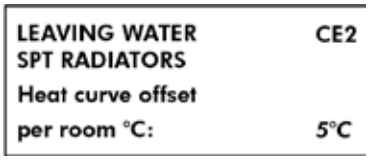
- Room temperature setpoint
- Variance between the setpoint and the room temperatures
- **PAC HT** On/Off control via the room temperature

##### 2.3.3.1.1. ROOM TEMPERATURE SETPOINT

As a default setting, the heat curve is calculated for a desired room temperature of 20°C. As opposed to a dry contact "limiting" room thermostat, the **PAC HT** will alter its heat curve if the user changes the set room temperature. Increasing the room temperature setpoint by one degree (e.g. from 20°C to 21°C) translates into an increase in the heat curve of between 2° C and 3°C.

2.3.3.1.2. VARIANCE BETWEEN TEMPERATURE SETPOINT AND ROOM TEMPERATURE

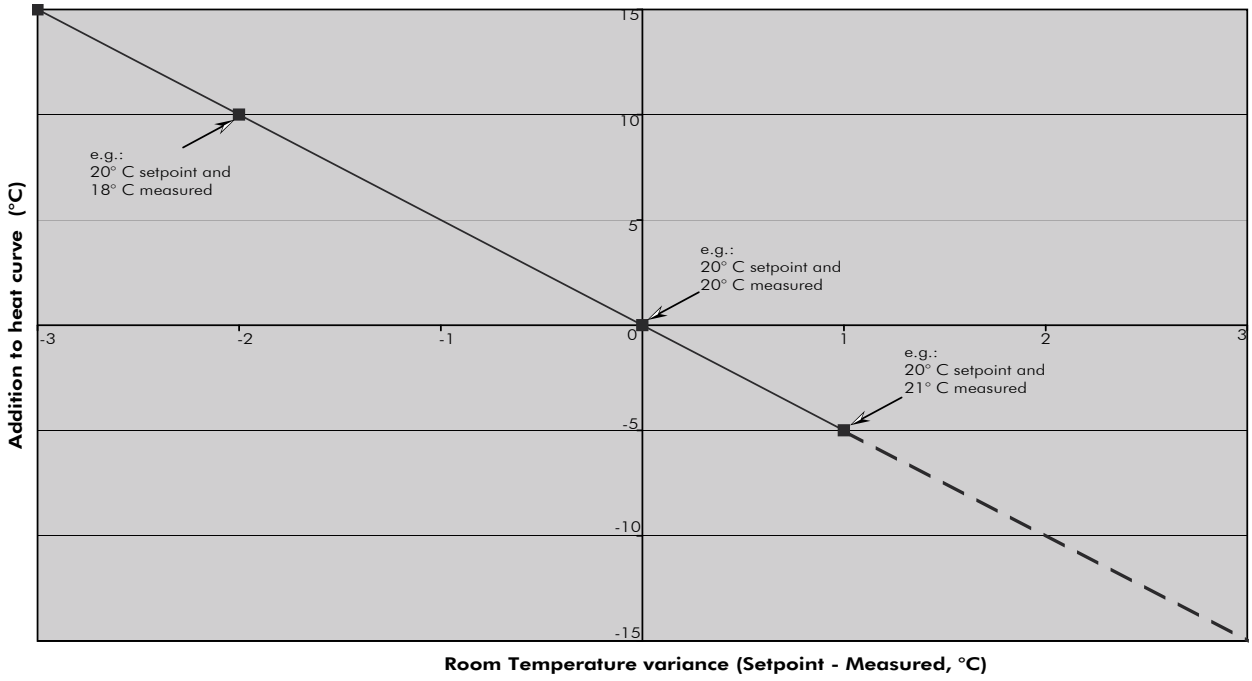



In theory, the heat curve enables a given room temperature to be maintained, but the **PAC HT** also takes account of the variance between the measured temperature and the set temperature. Accordingly, the temperature rise is faster when the variance is greater, e.g. after night time slow running. Taking account of this ambient temperature variance also remedies any errors in heat curve parameter settings.

The increase in the heat curve per degree of ambient temperature to be made up can be configured via the ***Heat curve offset per room °C*** parameter. The default setting is 5°C in the case of radiators (Refer to the § **RADIATORS / FLOOR HEATING CONFIGURATION**, page 15) for further details).

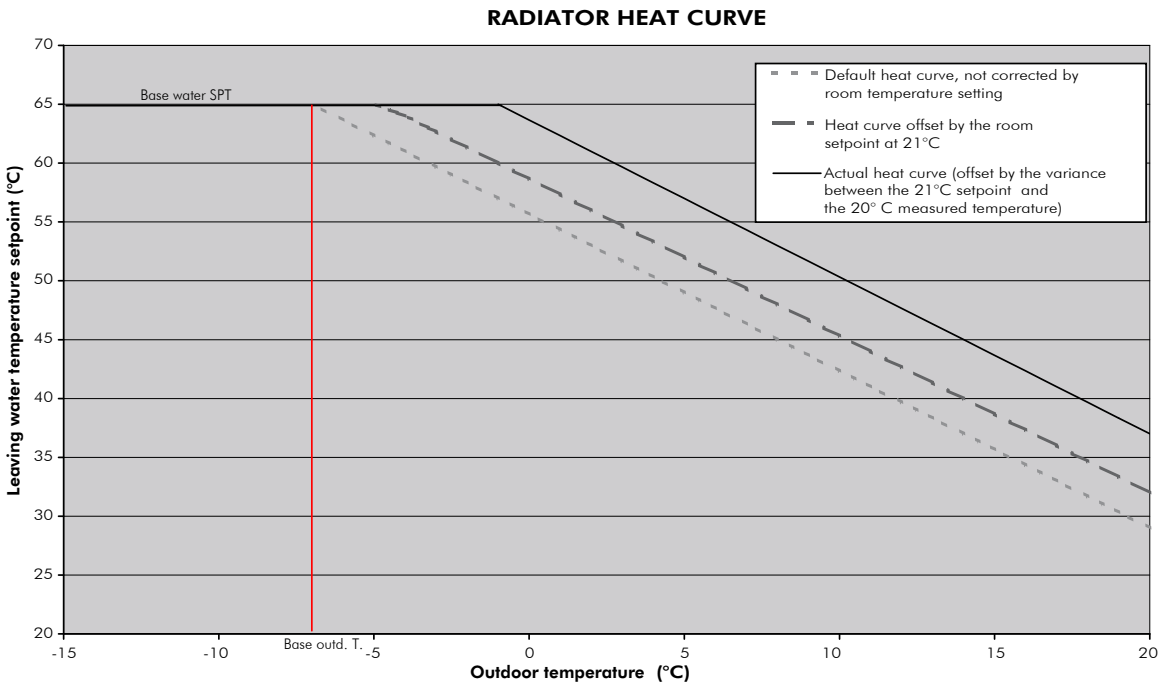
**HEAT CURVE OFFSET PER °C OF ROOM TEMPERATURE TO BE MADE UP – RADIATOR CONFIGURATION**



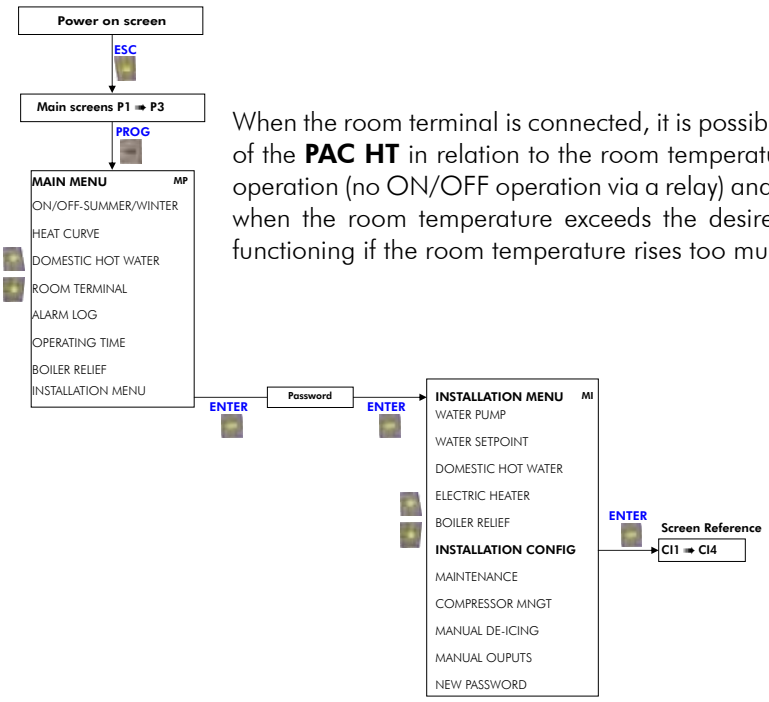

For example, this means that the room temperature setpoint is at 20°C but the measured temperature is at 19°C, and that the heat curve will be increased by 5°C. This increase is capped at ± 15°C. This offset will be negative if the room setpoint is exceeded (Refer to the § **PAC HT ON/OFF CONTROL BY ROOM TEMPERATURE**, page 13).

**heat curve calculation example**

- Default heat curve (water leaving temperature at 65°C at -7°C, correction coefficient at 0.8)
- Room temperature setpoint = 21°C
- Room temperature = 20°C
- Offset per °C of room temperature = 5°C




## 2.3.3.1.3. PAC HT ON/OFF CONTROL BY ROOM TEMPERATURE




When the room terminal is connected, it is possible to adjust the ON/OFF control parameters of the **PAC HT** in relation to the room temperature. While the terminal does not act to limit operation (no ON/OFF operation via a relay) and while the heat curve can be offset negatively when the room temperature exceeds the desired setpoint, the appliance should still stop functioning if the room temperature rises too much:

➢ ***Stop diff/SPT*** (Default: 1°C)
This parameter enables the user to set the maximum difference between the room temperature and the setpoint to switch the **PAC HT** off. For example, with a default setting of 1°C, this means that the appliance will stop operating if the room temperature rises above 21°C for a setpoint (SPT) at 20°C (even after reducing the heat curve by 5°C, Refer to the § **VARIANCE BETWEEN TEMPERATURE SETPOINT AND ROOM TEMPERATURE**, page 12).

| | |
|---|---|
| **ROOM TERMINAL** | **CI3** |
| **Connected:** | **Yes** |
| **Stop diff/SPT:** | **1.0°C** |
| **Start diff/SPT:** | **0.5°C** |

➢ ***Start diff/SPT*** (Default: 0.5°C)

This parameter enables the user to set the room temperature offset compared with the temperature setpoint to restart the **PAC HT**. For example, with a default setting of 0.5°C, this means that the appliance will restart if the room temperature falls below 20.5°C for a setpoint at 20°C. The room will always tend to be slightly warmer than the desired set temperature.

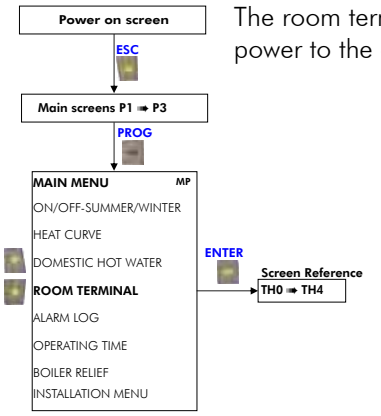
| ROOM TERMINAL | CI3 |
|---|---|
| Connected: | Yes |
| Stop diff/SPT: | 1.0°C |
| Start diff/SPT: | 0.5°C |

This offers the advantage that the regulation system will not wait for the room temperature to fall again below the setpoint and will anticipate restarting in order to avoid wide ambient temperature variations. At a setpoint of 20°C, the room should oscillate between 20°C and 21°C when the house's thermal inertia is taken into account.

The second advantage presents itself when the temperature is reduced for night time slow running. The **PAC HT** will anticipate restarting (e.g. will restart at 17.5° C when the temperature is lowered to 17°C) and will enable the heating circuit to be already up to temperature when the system switches to day time running mode in the morning. In this way, the time taken to raise the temperature will be reduced, while greatly improving comfort and maintaining the appliance's COP (Coefficient Of Performance), especially if the timer settings on the room terminal correspond to a peak energy day tariff from the electricity provider.

**There is always a minimum variance of 0.5°C between these two parameters.**

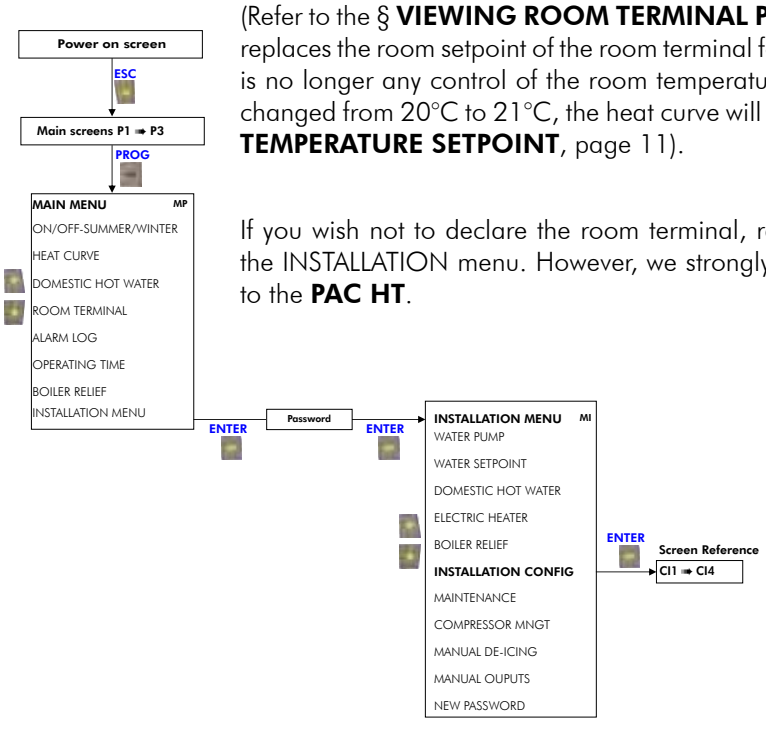
### 2.3.3.2. UNDECLARED ROOM TERMINAL




The room terminal is declared by default and the controller will generate an alarm when the power to the appliance is switched on when the terminal is not connected.

| CONNECTION CUT | TH0 |
|---|---|
| PAC HT / TERMINAL | |
| Room setpoint for | |
| heat curve: | 20.0°C |

When the room terminal is not declared, or when communication has been cut with the **PAC HT**, the heat curve is calculated as described previously in relation to the outdoor temperature, as well as in relation to a room setpoint parameter accessible on the appliance's display via the screen TH0. This screen displays the information instead of viewing the parameters of the room terminal (Refer to the § **VIEWING ROOM TERMINAL PARAMETERS**, page 50). This room setpoint replaces the room setpoint of the room terminal for the heat curve calculation. Naturally, there is no longer any control of the room temperature, but if, for example, this room setpoint is changed from 20°C to 21°C, the heat curve will rise from 2° C to 3° C (Refer to the § **ROOM TEMPERATURE SETPOINT**, page 11).

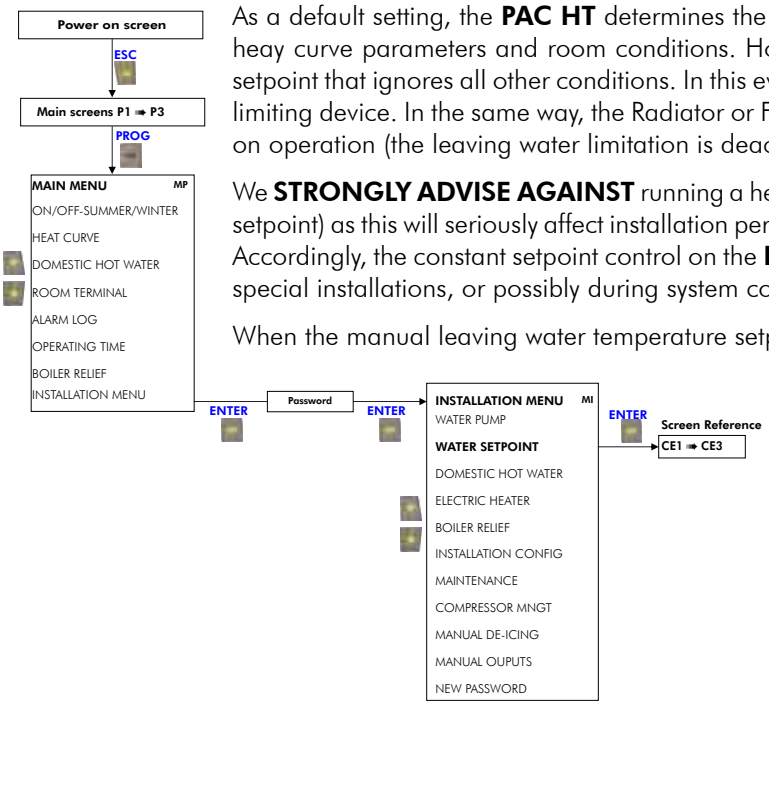



If you wish not to declare the room terminal, refer to the sub-menu Installation Config. in the INSTALLATION menu. However, we strongly advise that you connect the room terminal to the **PAC HT**.

| ROOM TERMINAL | CI3 |
|---|---|
| Connected: | Yes |
| Stop diff/SPT: | 1.0°C |
| Start diff/SPT: | 0.5°C |

| ROOM TERMINAL | CI3 |
|---|---|
| Connected: | No |

### 2.3.4. MANUAL LEAVING WATER TEMPERATURE SETPOINT (CONSTANT HEAT CURVE)




As a default setting, the **PAC HT** determines the set leaving water temperature in relation to heay curve parameters and room conditions. However, it is possible to use a leaving water setpoint that ignores all other conditions. In this event, the room terminal only acts as a system limiting device. In the same way, the Radiator or Floor Heating configuration has no influence on operation (the leaving water limitation is deactivated).

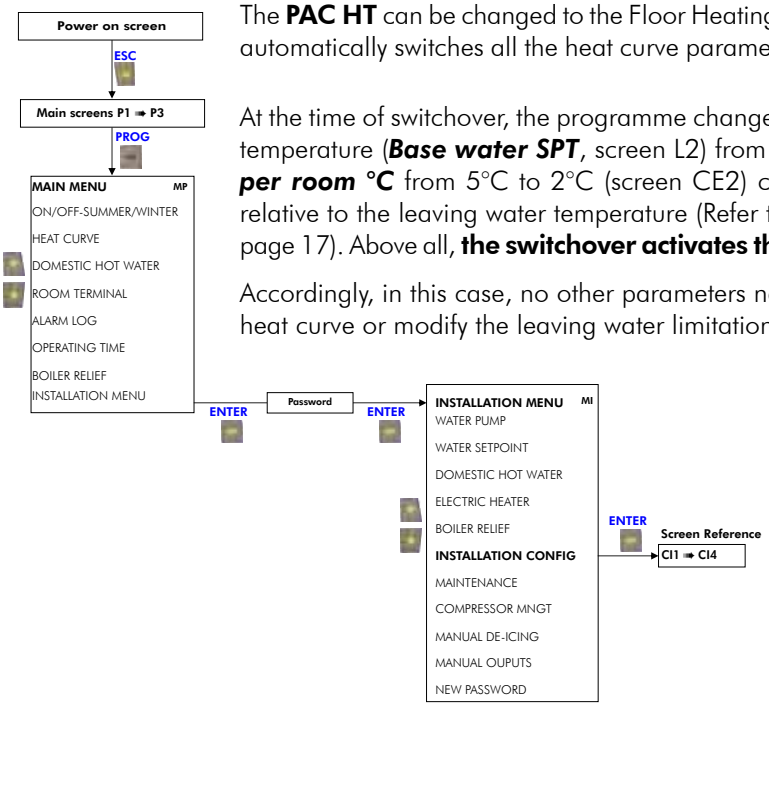
We **STRONGLY ADVISE AGAINST** running a heat pump without heat curve control (constant setpoint) as this will seriously affect installation performance, while reducing occupant comfort. Accordingly, the constant setpoint control on the **PAC HT** should only be used in cases of very special installations, or possibly during system commissioning.

When the manual leaving water temperature setpoint is used, the default setting is 45°C.

## 2.4. RADIATORS / FLOOR HEATING CONFIGURATION

The primary aim of the **PAC HT** is to produce water up to 65°C in a radiator heating circuit. Nevertheless, it is possible to make it operate directly and provide leaving water for a floor heating system by adapting the heat curve. In this case, it is **IMPERATIVE** to change the **PAC HT** configuration over to ***Floor Heating*** (as opposed to changing the parameters one by one) to be able to benefit from the advantages of the special features of the Floor regulation system.

### 2.4.1. CHANGING FROM RADIATORS TO FLOOR HEATING CONFIGURATION

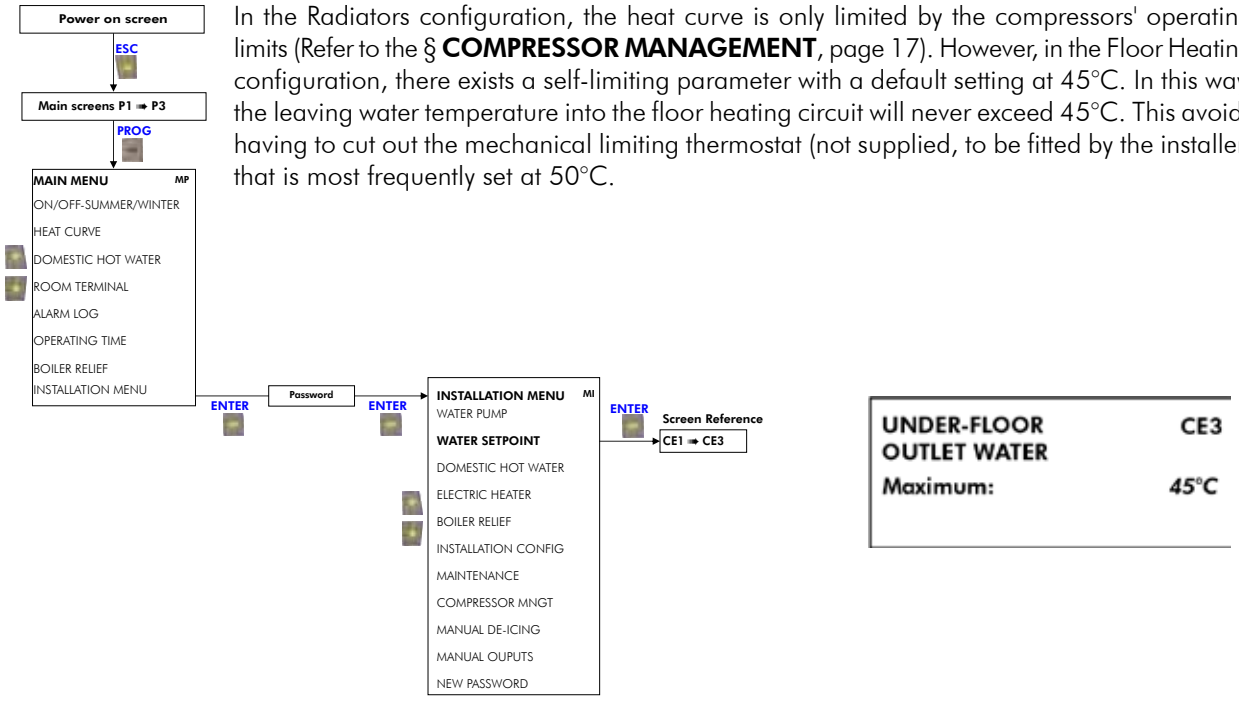



The **PAC HT** can be changed to the Floor Heating configuration via a **single parameter** that automatically switches all the heat curve parameters from Radiator Heating to Floor heating.

At the time of switchover, the programme changes the leaving water setpoint at base outdoor temperature (***Base water SPT***, screen L2) from 65°C to 35°C. and the ***Heat curve offset per room °C*** from 5°C to 2°C (screen CE2) changes the law that stops the compressors relative to the leaving water temperature (Refer to the § **COMPRESSOR MANAGEMENT**, page 17). Above all, **the switchover activates the leaving water limitation (screen CE3)**.

Accordingly, in this case, no other parameters need to be changed, other than to adjust the heat curve or modify the leaving water limitation.

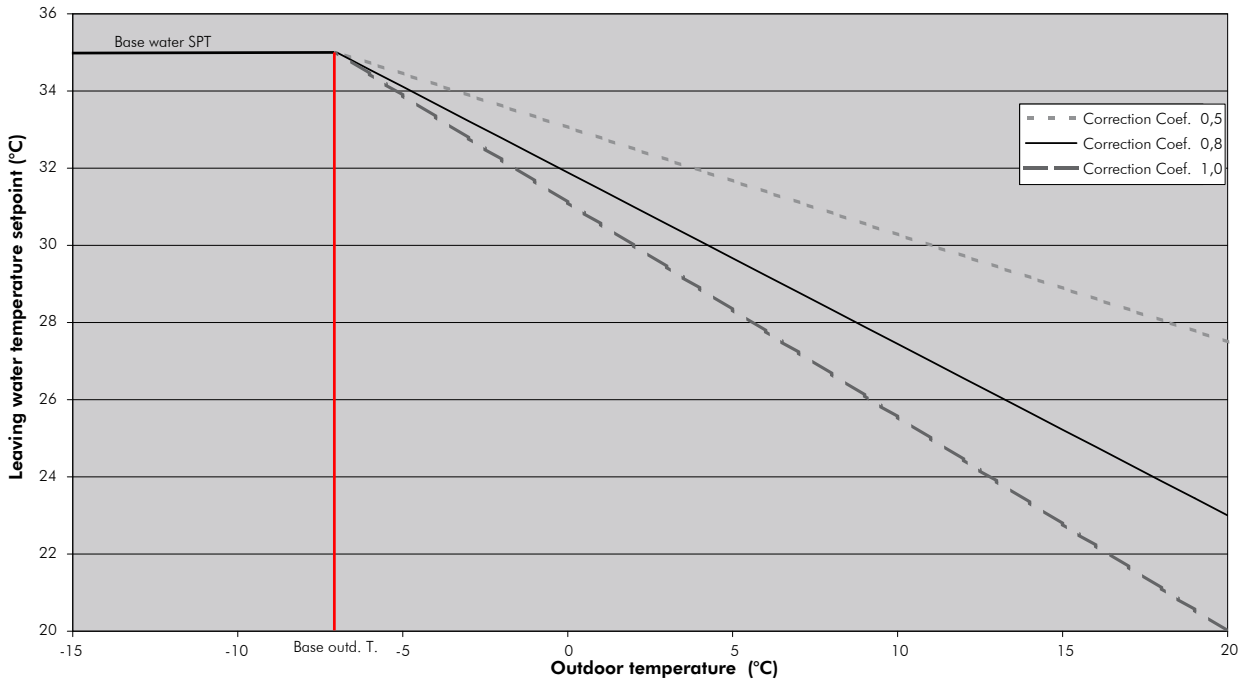
## 2.4.2. LEAVING WATER TEMPERATURE LIMITATION




In the Radiators configuration, the heat curve is only limited by the compressors' operating limits (Refer to the § **COMPRESSOR MANAGEMENT**, page 17). However, in the Floor Heating configuration, there exists a self-limiting parameter with a default setting at 45°C. In this way, the leaving water temperature into the floor heating circuit will never exceed 45°C. This avoids having to cut out the mechanical limiting thermostat (not supplied, to be fitted by the installer) that is most frequently set at 50°C.

The leaving water temperature limitation acts on the **PAC HT**'s temperature setpoint. If the limit is set at 45°C, then the maximum leaving water temperature setpoint will be 44°C and this value will be displayed on screen P1 (compressors stop at the set temperature + 1°C, refer to the § **COMPRESSOR MANAGEMENT**, page 17).

**FLOOR HEATING HEAT CURVE**



## 2.5. COMPRESSOR MANAGEMENT

### 2.5.1. TECHNICAL OPERATING LIMITS

#### 2.5.1.1. IN RELATION TO OUTDOOR TEMPERATURE

The outdoor temperature plays an important role in limiting the operation of the two stage system. The **PAC HT** limits itself automatically and cannot operate in two stages at outdoor temperature > 7°C. In this case, the leaving water temperature is limited at 55°C in single compressor operation in heating mode and at 60°C in Domestic Hot Water mode (Refer to the § **DHW**).

The compressors are always subject to the following anti-short cycle timers (other than in an alarm situation):

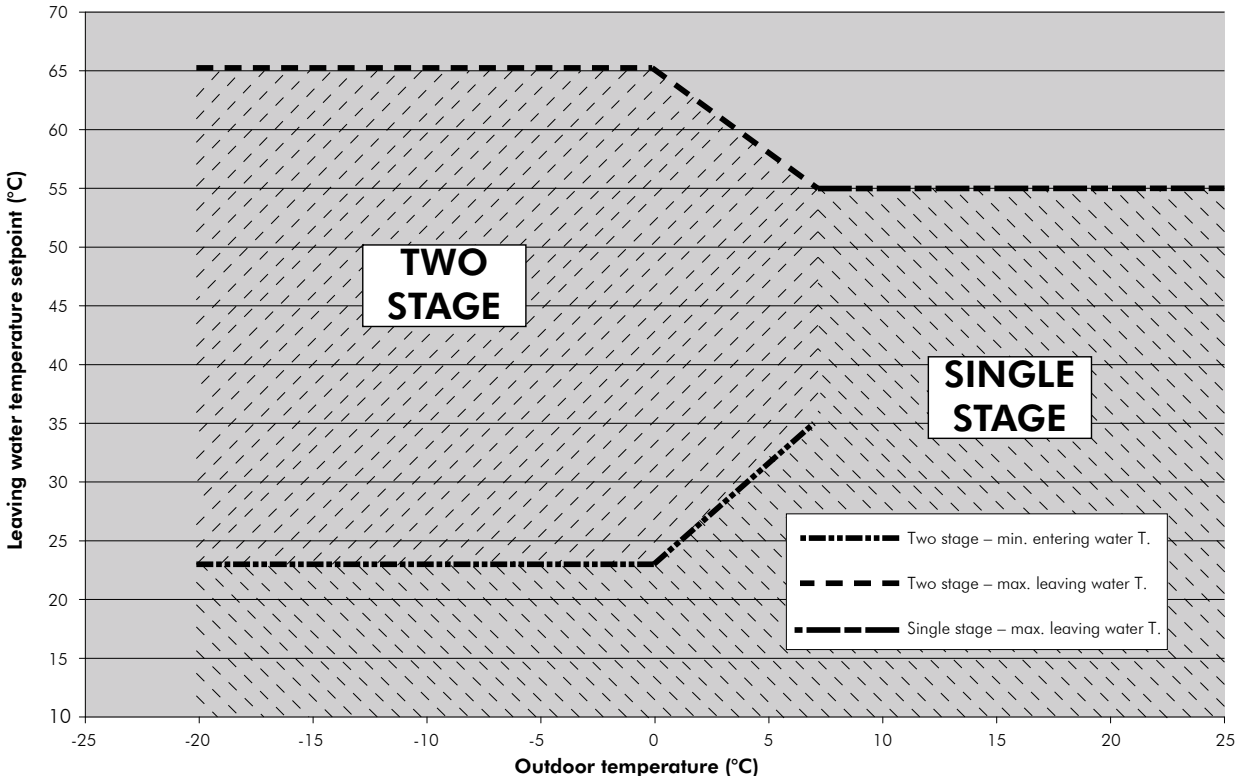
- Minimum ON: 120 seconds
- Minimum OFF: 60 seconds
- Between two starts: 300 seconds

#### 2.5.1.2. IN RELATION TO ENTERING WATER TEMPERATURE

The entering water temperature also plays a role to authorise, or otherwise, operation in two stage mode. For entering water temperature < 23°C, two stage operation is never authorised (e.g. case of commissioning). Accordingly, the **PAC HT** will operate in single stage mode without a minimum limitation on the entering water temperature.

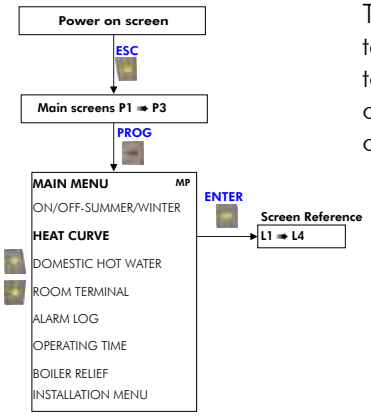
**Nevertheless, we strongly advise against starting a PAC HT on a heating circuit with a water temperature below 10°C.**

**SINGLE /TWO STAGE OPERATING LIMITATIONS**

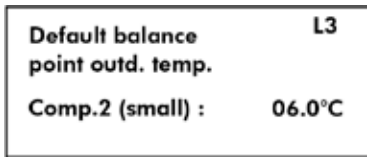


## 2.5.2. CHOICE OF COMPRESSOR IN RELATION TO THE HOUSE'S THERMAL LOAD (HEATING MODE)

### 2.5.2.1. C2 SMALL COMPRESSOR DEFAULT BALANCE POINT




The heat curve parameters enable the regulation system to determine the outdoor temperature above which the capacity from the small compressor will be sufficient to heat the house to the desired temperature setpoint. This balance point (viewable on screen L3) is around +6°C with the default heat curve (depending on the model of **PAC HT**).



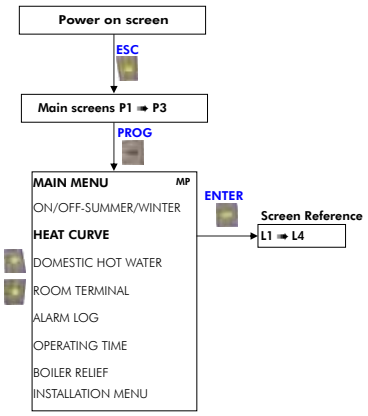

**Outdoor temperature > Balance point ➠ Small compressor**

**Outdoor temperature < Balance point ➠ Full capacity**

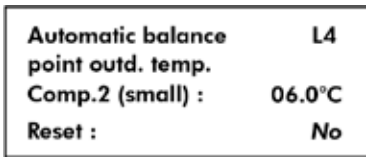
Full capacity means both compressor stages or large C1 compressor in operation. If the operating limits of the two-stage compressor prevent it from starting, then the large compressor will be selected.

In this way, the **PAC HT** engages the compressor(s) best suited to achieve the most appropriate Comfort/Electricity consumption compromise. When conditions allow, the **PAC HT** benefits from the small compressor operating on its own, which is half as powerful, to provide sufficient capacity for heating needs, while guaranteeing high performance and smoother operation. This also leads to longer service life.

### 2.5.2.2. AUTOMATIC BALANCE POINT / LACK OF CAPACITY




In the case where the heat curve is not entirely accurate, and therefore where the theoretical default balance point is also incorrect, the **PAC HT** is designed to detect that the small compressor is inadequate to heat the house due to a lack of capacity. After a few minutes operation, if the water temperature is not rising fast enough, the controller will start the compressor(s) at full capacity, while automatically updating the balance temperature with the current outdoor temperature. Accordingly, at the next start-up, the **PAC HT** will select full capacity running instead of attempting to start the small compressor again.




The automatic balance temperature is limited by the default balance temperature ± 2°C.

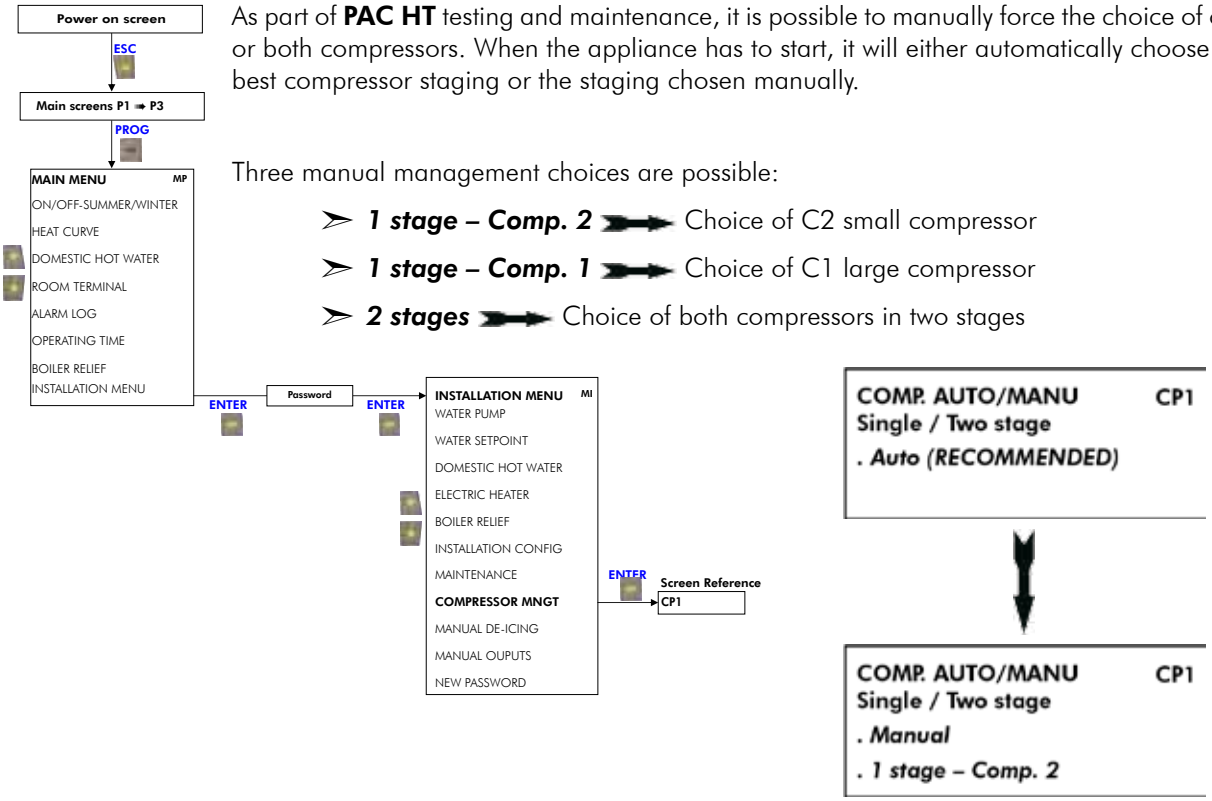
It is possible to reset this automatic balance temperature. It will then revert to the default value calculated by the controller (screen L3).

It is also possible that the controller detects a lack of capacity in the case where the volume of water in the installation is greater than the recommended volume (200 to 250 L). If a very high volume is present, the heating circuit's inertia will be stronger and the rate of the rise in water temperature will be slower. In this event, the **PAC HT** will change to full capacity operation more easily with the aim of raising the water temperature faster for greater comfort.

### 2.5.2.3. ONE COMPRESSOR NOT STARTING

In the case where the **PAC HT** detects that one of the compressors has not started, it will prevent any future start-up of the compressor in question and automatically switch over to the other. This feature ensures that a minimum of heating is provided in the residence in compressor alarm operating mode.

### 2.5.3. MANUAL COMPRESSOR MANAGEMENT




As part of **PAC HT** testing and maintenance, it is possible to manually force the choice of one or both compressors. When the appliance has to start, it will either automatically choose the best compressor staging or the staging chosen manually.

Three manual management choices are possible:

- ***1 stage – Comp. 2*** ➡ Choice of C2 small compressor
- ***1 stage – Comp. 1*** ➡ Choice of C1 large compressor
- ***2 stages*** ➡ Choice of both compressors in two stages

**The 2 stages choice ensures that the appliance's operating limits are not exceeded. If the outdoor and entering water temperature conditions do not permit the two compressors to start, the PAC HT will remain inactive and the "Waiting Water T" message will be displayed.**

**Manual management of the compressors cannot exceed a period of 30 minutes. At the end of this period, the compressors management mode will revert to automatic. This avoids the compressor setting being forgotten when the site is left, for example.**

### 2.5.3.1. COMPRESSOR CONTROL IN RELATION TO WATER TEMPERATURE IN HEATING MODE

#### 2.5.3.1.1. COMPRESSOR START-UP

Even though the water temperature setpoint (calculated by the heat curve) is that of the leaving water (65°C maximum), the entering water temperature (equal to the leaving water temperature as the compressors are stopped) is used for start-up in accordance with the following conditions:

Entering water < Leaving setpoint – ΔT compressor(s) – 2°C

ΔT compressor(s) is the T variance (Leaving – Entering) registered when the compressors previously stopped. The default values in Heating mode (in the case of the power supply being switched on) are 5°C with the C2 small compressor and 10°C for the two stage compressor, and 3.5°C and 7°C for an Floor heating application (if the type of heating application has been configured, Refer to the § **RADIATORS / FLOOR HEATING CONFIGURATION**, page 15).

The control system always considers that the two stage ΔT is equal to 2 x ΔT C2 as the two stage compressor is theoretically twice as powerful as the small compressor.

In this way, the **PAC HT** always operates for the right amount of time (if the minimum water volume in the installation is correct) and adapts to the change in compressor staging and the different not nominal water flows.

**This does not mean that the PAC HT accepts a variable water flow, but that it adapts to different heating installations in which the flow is not necessarily the recommended flow.**

**Example**

For a leaving temperature setpoint at 50°C in a Radiator application:

C2 will be authorised if Entering water T. < 43°C (50°C – 5°C – 2°C).

C1+C2 will be authorised if Entering water T. < 38°C (50°C – 10°C – 2°C).

#### 2.5.3.1.2. COMPRESSOR STOP

Compressor stop is managed by the temperature of the leaving water in accordance with the following:

Leaving water T. > Leaving water setpoint + Stop offset T.

The stop offset T. is set at 3°C in the Radiator application and at 1°C in the Floor heating application.

**Example**

For a leaving water setpoint of 50°C in a Radiator application:

The compressors will stop at a leaving water temperature > 53°C (50°C + 3°C).

This stop condition is not followed in the case where the leaving water setpoint is already limited by overall compressor operation parameters (55°C in single stage operation and 65°C in two stage operation for example). The **PAC HT** control system will not allow the leaving water temperature to exceed its operating limits, irrespective of the requested setpoint.

**Example**

For a leaving water setpoint at 64°C in a Radiator application at -5°C outdoor temperature:

The compressors will stop at a leaving water temperature > 65°C (and not 67°C).

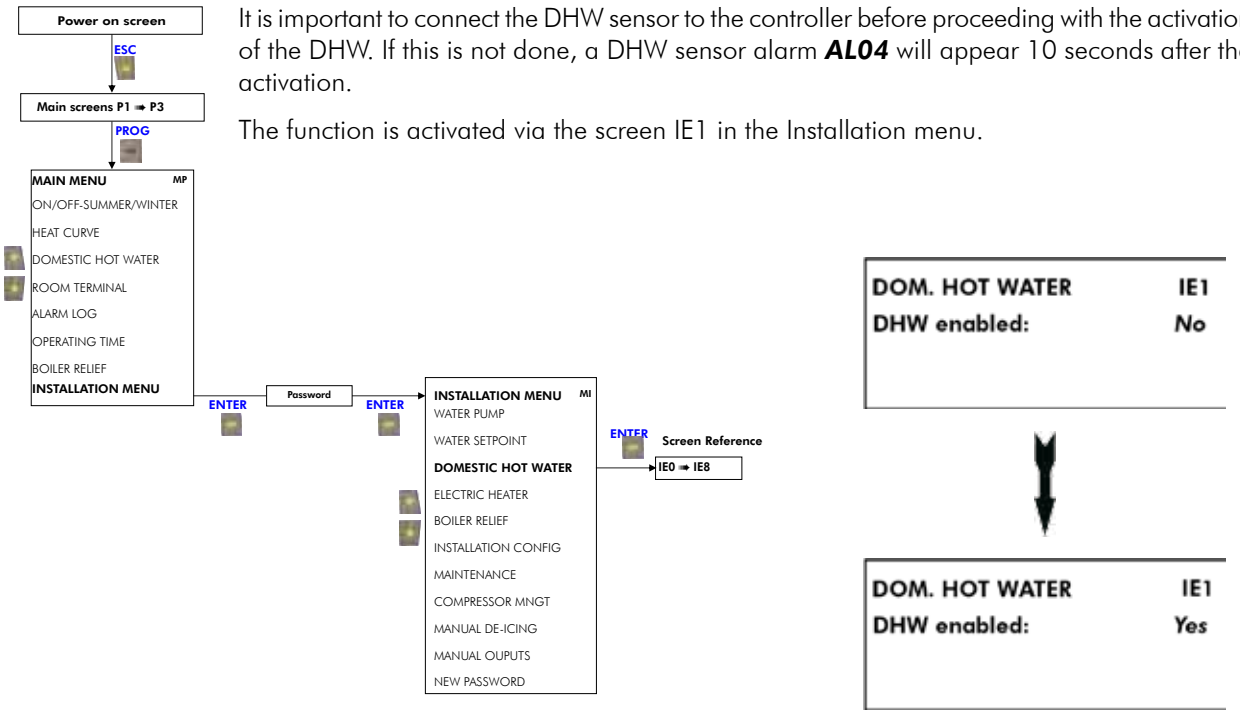
## 2.6. DOMESTIC HOT WATER

This function requires the installation of a DHW tank or a heat exchange system to supply the DHW tank (plate exchanger type) compatible with the capacity and the water temperatures of a **PAC HT**. The DHW tank available as a kit guarantees effective operation of the DHW option as it includes an internal heat exchanger with a sufficient surface area (over 3m²) and a back-up heating resistance. In the case of the use of a different system, some functions (e.g. Legionnaires' Disease Protection) will be inoperative and there is no guarantee that the satisfactory DHW temperature will be reached.

It is also necessary to connect a specific DHW temperature sensor to the appliance's regulation system (Refer to the Installation Manual).

Two separate menus on the display are used for setting DHW parameters. In the main menu, the DHW screens provide simple everyday user access (temperature setpoint, timer programming …) while the Installation menu covers the configuration choices possible at the time of **PAC HT** installation (DHW activation, setting off-peak hours operation, Legionnaires' Disease Protection, room temperature management, water pump management …).

### 2.6.1. DHW FUNCTION ACTIVATION




It is important to connect the DHW sensor to the controller before proceeding with the activation of the DHW. If this is not done, a DHW sensor alarm ***AL04*** will appear 10 seconds after the activation.

The function is activated via the screen IE1 in the Installation menu.

### 2.6.2. DHW DEMAND AND ROOM TEMPERATURE MANAGEMENT

#### 2.6.2.1. DHW DEMAND

The **PAC HT** considers that there is a demand for DHW production when the temperature read by the DHW sensor falls 2° C below the setpoint. For example, if the setpoint is 50°C, there will be a demand for DHW for a temperature measured below 48°C.

The demand for DHW is considered as satisfied when the DHW temperature exceeds the setpoint by 2°C (***Diff. comp. stop***, screen IE8). For a setpoint at 50°C, this means that the DHW temperature is going to oscillate between 48°C and 52°C.

### 2.6.2.2. DHW MANAGEMENT RELATIVE TO ROOM TEMPERATURE

When the room terminal is connected, the **PAC HT** can decide whether to give priority to Heating or DHW production.

The DHW or Heating priority can be configured via two parameters:

➢ ***Min. Dif./Room T. for DHW start*** (Default setting: 2°C)

If the room temperature is lower than the room setpoint minus this value, the **PAC HT** remains in Heating mode until the room temperature is restored above this limit. For example, for a room setpoint of 20°C, the switchover to DHW will only occur if the room temperature is above 18°C (during 5 consecutive minutes).

| DOM. HOT WATER | IE5 |
|---|---|
| Min. dif./Room T. for DHW start: | 2.0°C |
| Max. delay: | 060min |

➢ ***Max. delay*** (Default setting: 60 minutes)

Beyond this period of demand for DHW production, the **PAC HT** will automatically switch to DHW mode, irrespective of the room temperature. This time period, set at 60 minutes is a good compromise between heating comfort and readily available domestic hot water. Moreover, if the timer has been programmed or if an off-peak hours electricity relay has been connected to the **PAC HT**, this set-up ensures that the optimum time period for DHW production is not missed.

To afford greater priority to Heating for example, the ***Max delay*** can just be increased (up to 3 hours) and/or the ***Min. Dif./Room T. for DHW start*** can be changed to 0°C instead of 2°C. In this case, the **PAC HT** will be able to remain in Heating mode for 3 hours or until the room temperature has reached the room setpoint. However, there is a risk of not having DHW at the desired temperature at the end of the off-peak period, for example.

On the other hand, priority can be afforded to DHW by changing the ***Max. delay*** to 0 minute.

### 2.6.2.3. PAC HT IN SUMMER MODE

When the **PAC HT** is in Summer mode (Refer to the § **SUMMER/WINTER**, page 7), the room temperature is no longer taken into account and the changeover to DHW mode is instantaneous during a demand for DHW production.

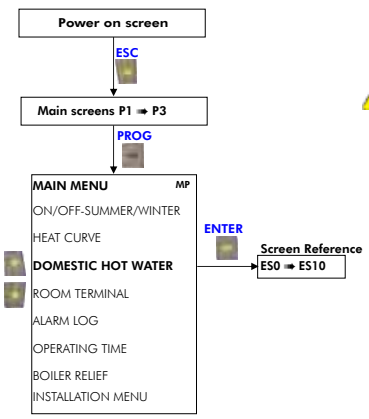
### 2.6.2.4. ROOM TERMINAL NOT CONNECTED

When the room terminal is not connected to the **PAC HT**, the changeover to DHW mode is identical to operation in Summer mode.

### 2.6.3. COMFORT/ECO TEMPERATURE SETPOINTS (SCHEDULING)

The user can set the DHW parameters to fulfil all types of needs. To achieve this, the **PAC HT** proposes two temperature setpoints: Comfort and Eco, as well as two operating modes: pERMANENT Comfort and Comfort/Economy. Similarly, there are TWO types of timer programming: via digital input (dry contact) or via daily scheduling (timer programming).

### 2.6.3.1. ECO/COMFORT TEMPERATURE SETPOINTS



The first screen on the DHW menu is only devoted to viewing system operation (current temperature setpoint and current mode, Comfort or Eco) and does not enable any modifications.

| DOM. HOT WATER | ES1 |
|---|---|
| Current SPT: | 50°C |
| Current mode: | Comf. |

| DOM. HOT WATER | ES2 |
|---|---|
| Mode: | Comf./Eco. |
| Comfort SPT: | 50°C |
| Economy SPT: | 45°C |

➢ ***Comf./Eco.* mode (Default setting)**

The mode determines how the appliance is going to choose the DHW temperature setpoint.

As the default setting in ***Comf./Eco.***, this means that the **PAC HT** is going to switch between the two Comfort and Economy temperature setpoints either in relation to the off-peak hours status (connection to the electricity meter) or in relation to the daily scheduling.

It is possible to configure the mode in ***Perm. Comf.*** (for permanet Comfort). This will **continuously** force the DHW setpoint to the Comfort setpoint (not recommended).

➢ ***Comfort* and *Eco* setpoint (Default settings: 50°C and 45°C)**

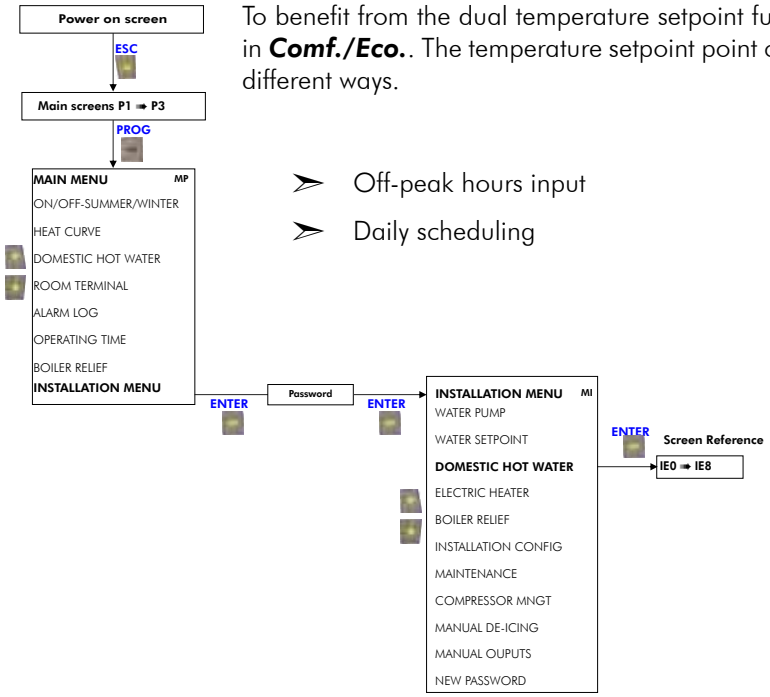
These are the temperature setpoints used in relation to the current mode. These setpoints provide domestic hot water at the right temperature in Comfort mode (e.g. hot water production during off-peak hours at night) and restart production at a lower temperature when the tank has cooled down (e.g. during the day). In this way, comfort is maintained for the user, while ensuring that the **PAC HT** operates under optimum conditions.

To prevent any restart of DHW production during the day time and to produce DHW only during the night, the user just has to set the Eco temperature at 10°C (minimum setting). This setting corresponds to the Anti-freeze protection setting.

These setpoints have been chosen to be compatible with compressor operation. If they are increased to values beyond 55°C, the **PAC HT** will be unlikely to supply DHW at the desired temperature. This will lead to the possible start-up of the electric heat (fitted in the DHW tank as an option) and would considerably increase the system's electricity consumption. In the worst case, and insofar as the system's priority is to always provide DHW at the required temperature, **it is possible that DHW could only be produced by the electric heater. These default settings guarantee that DHW will be produced without recourse to the electric heater.**

# WE STRONGLY ADVISE AGAINST INCREASING THE DHW TEMPERATURE SETPOINTS BEYOND 53°C.

### 2.6.3.2. COMFORT/ECO CHANGEOVER




To benefit from the dual temperature setpoint function, the DHW mode must be configured in ***Comf./Eco.***. The temperature setpoint point changeover can then be programmed in two different ways.

- Off-peak hours input
- Daily scheduling

#### 2.6.3.2.1. OFF-PEAK HOURS INPUT

The default parameters are set on the **PAC HT** to use the off-peak hours contact (ID11 digital input on the conttroller). It is also possible to configure the type of switching of this input to Normally Open (NO, by default) or Normally Closed (NC). The NO parameter setting means that the DHW will use the Comfort setpoint (e.g. at night) when the contact is closed. Therefore, as a default, if the off-peak hours contact is not connected, the DHW will remain permanently in Eco mode (as the unwired contact is open).

| DOM. HOT WATER | IE2 |
|---|---|
| ECO mode selection: | |
| . *Off peak - ID11* | |
| . *NO: Closed = DHW* | |

#### 2.6.3.2.2. DAILY SCHEDULING

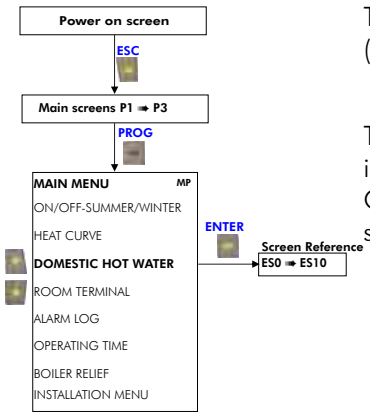
**THIS FUNCTION REQUIRES THE ROOM TERMINAL TO BE INSTALLED.**

To gain access to the timer programming screens from the Main Menu, it is previously necessary to switch the ***Off-Peak hours – ID11*** parameter to ***Scheduling***

| DOM. HOT WATER | IE2 |
|---|---|
| ECO mode selection: | |
| . *Off peak - ID11* | |
| . *NO: Closed = DHW* | |

➠

| DOM. HOT WATER | IE2 |
|---|---|
| ECO mode selection: | |
| . *Scheduling* | |




The time is programmed via the 7 screens (ES4 to ES10) available for this purpose (1 per day of the week). Two time periods can be programmed for each day.

The time periods, marked 1. and 2., represent the hours when the Comfort mode is activated (higher setpoint, START to start operation and STOP to stop operation). Outside these hours, the DHW will operate at the Eco setpoint (i.e. the lower setpoint).

| | MONDAY | ES4 |
|---|---|---|
| Comfort | START | STOP |
| 1. | *00:00* | *05:00* |
| 2. | *23:00* | *24:00* |

As a default setting, the Comfort mode is activated every day between Midnight and 05h00 in the morning and between 23h00 and Midnight. In this way, the PAC HT mainly produces DHW during the night when the demand for heating is generally reduced, while benefiting from any possible off-peak electricity tariff.

The time periods can be altered in increments of one hour, while the minutes can be altered in increments of 10 minutes.

The display automatically requires a difference of at least one hour to be maintained between the START and STOP times to avoid inverting these two time settings (START time < STOP time - 1). If the two time periods overlap, the controller will take account of the earliest start time and the latest stop time.

It is also possible to use only one time period per day by deactivating time period 2 ("--" parameter to be set on START time). If the first time period is deactivated, the DHW will remain in Eco mode.

Time period 2 deactivation (e.g. case of DHW production only in the morning).

The START hour of this time period has to be changed to "--" (via the Up or Down arrows).

| | MONDAY | ES4 |
|---|---|---|
| Comfort | START | STOP |
| 1. | 00:00 | 05:00 |
| 2. | --:-- | : |

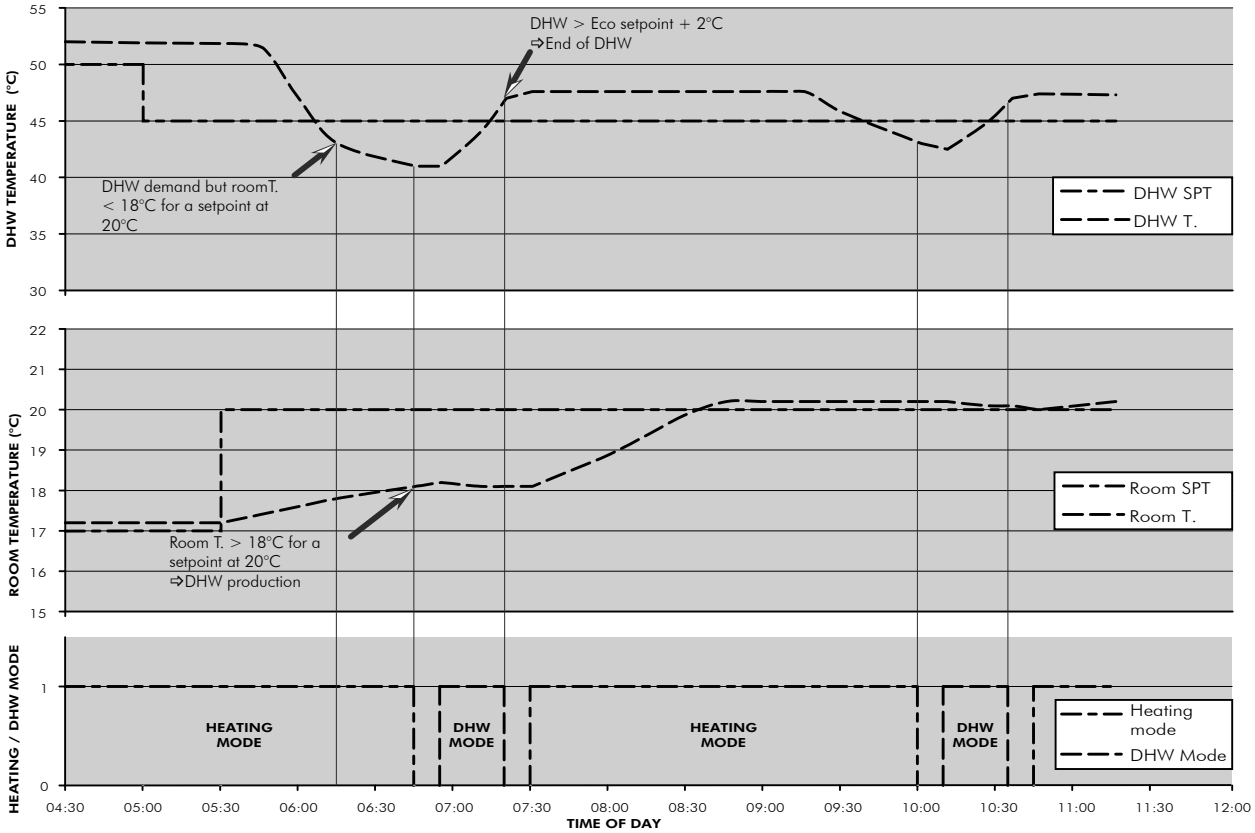
Both time periods deactivated. In this case, the Eco mode runs continuously during the day (e.g. useful in a second home where the DHW mode can be deactivated during the week. The START hour of the time period has to be changed to "--", that willl automatically deactivate time period 2.

| | MONDAY | ES4 |
|---|---|---|
| Comfort | START | STOP |
| 1. | --:-- | : |
| 2. | : | : |

### 2.6.3.2.3. EXAMPLES OF DIFFERENT DHW OPERATING PATTERNS

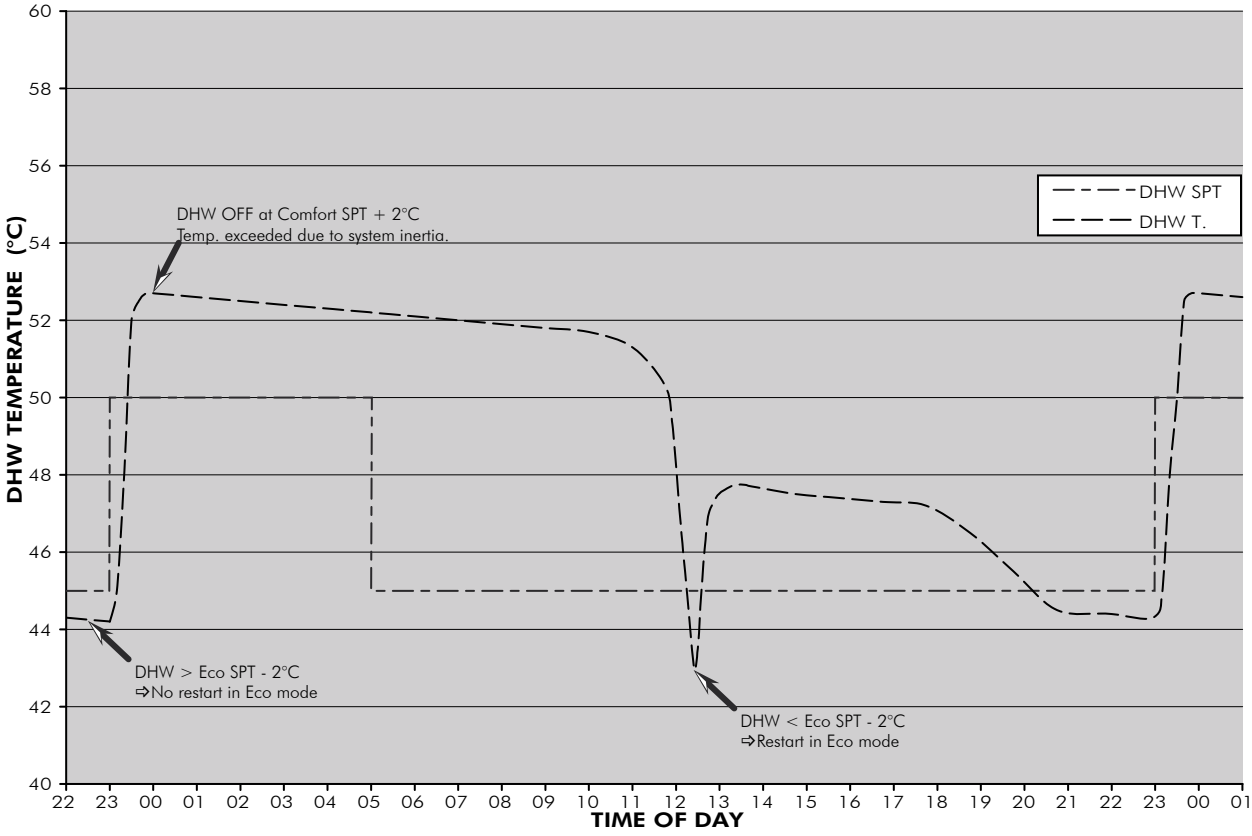
**These examples are provided for information purposes only. The different heating or DHW production timeframes are not necessarily representative of all possible installations. These heating times are closely linked to the PAC HT's operating conditions, to the type of heating emitters and the level and frequency of demand for DHW.**

**Heating and DHW mode operation in relation to scheduling, restart after night time running**

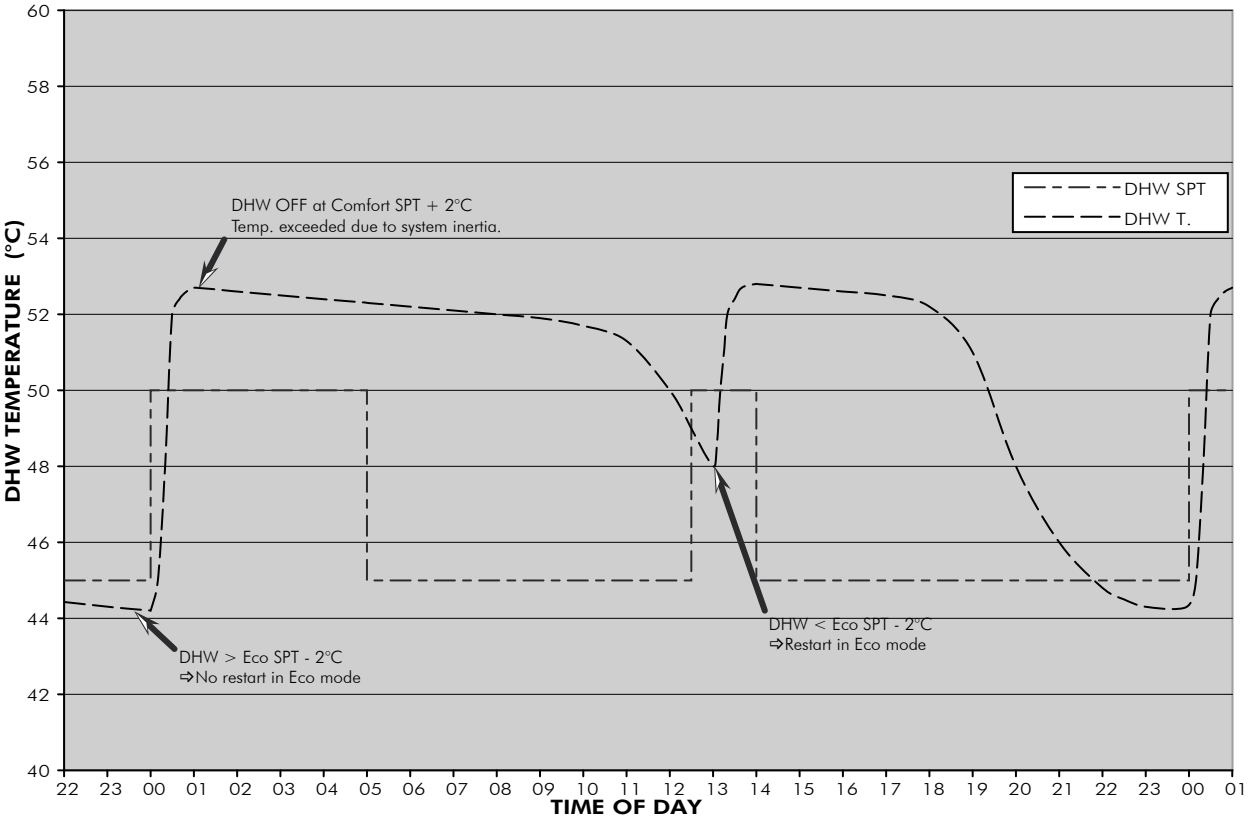


### 3 DHW schedulings (via off-peak hours input or daily scheduling) without consideration for Heating demand

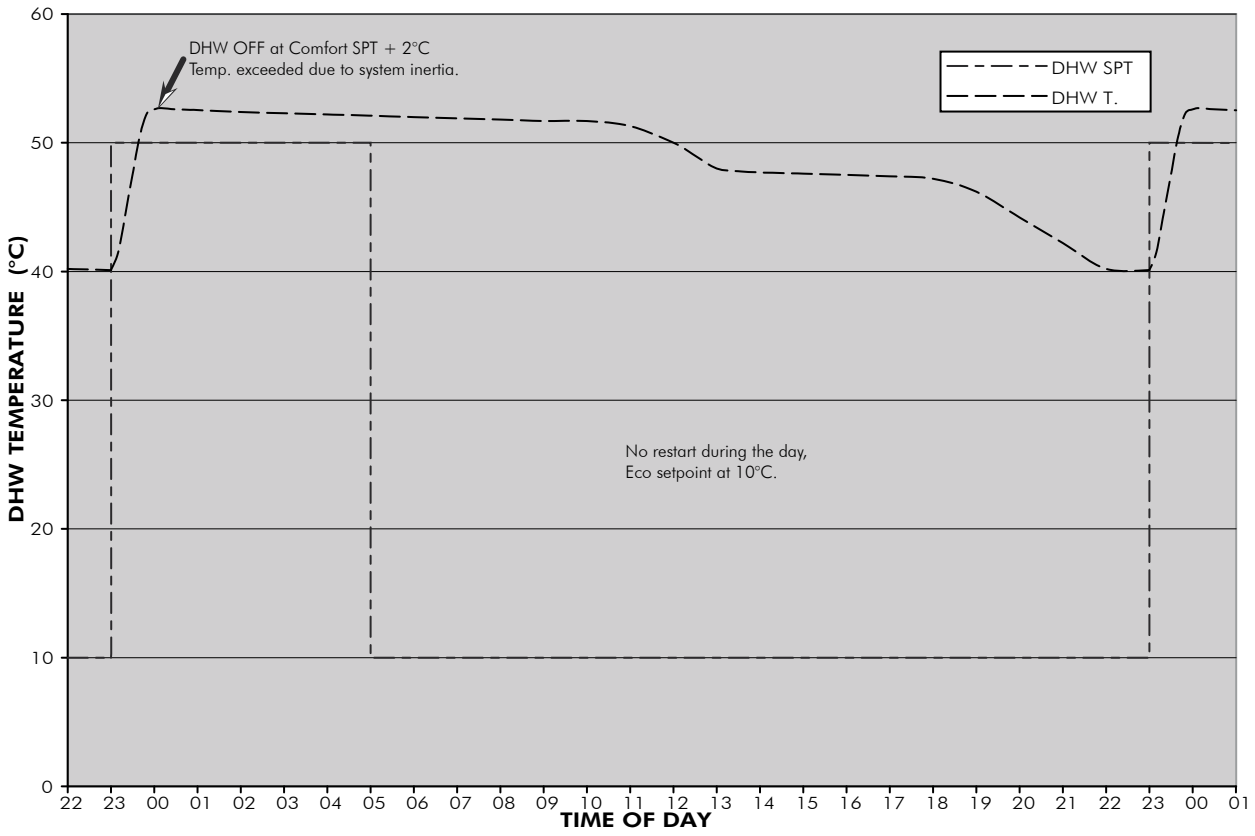
Off-peak input connected or default daily scheduling (Comfort between 23h00 and 05h00 in the morning, Eco the rest of the time), Comfort and Eco setpoints at 50°C and 45°C default settings




Off-peak input connected or daily scheduling with a restart at midday (Comfort between 0h00 and 05h00 in the morning and between 12h30 and 14h00, Eco the rest of the time), Comfort and Eco setpoints at 50°C and 45°C default settings



Off-peak input connected or default daily scheduling (Comfort between 23h00 and 05h00 in the morning, Eco the rest of the time), set Comfort and Eco temperatures at 50°C and 10°C, no DHW production during the day.


DHW OFF at Comfort SPT + 2°C
Temp. exceeded due to system inertia.
DHW SPT
DHW T.
No restart during the day,
Eco setpoint at 10°C.
DHW TEMPERATURE (°C)
TIME OF DAY
60
50
40
30
20
10
0
22 23 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01

Default scheduling settings during the week but continuous operation in Comfort mode during the weekend.

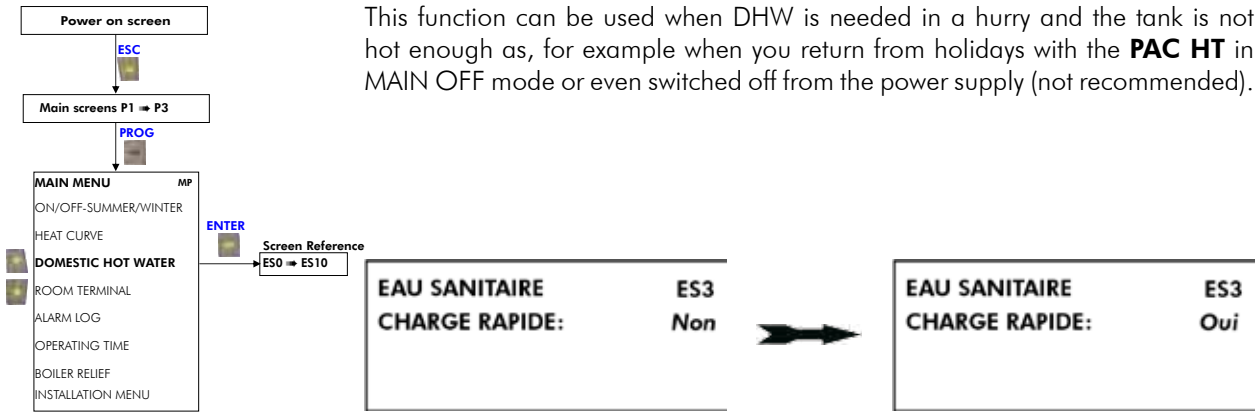
| | MONDAY | ES4 | TUESDAY | ES5 | WEDNESDAY | | THURSDAY | | FRIDAY | ES8 |
|---|---|---|---|---|---|---|---|---|---|---|
| Comfort | START | STOP | START | STOP | START | | Comfort | START | Comfort | START | STOP |
| 1. | 00:00 | 05:00 | 00:00 | 05:00 | 00:00 | | 1. | 00:00 | 1. | 00:00 | 05:00 |
| 2. | 23:00 | 24:00 | 23:00 | 24:00 | 23:00 | | 2. | 23:00 | 2. | 23:00 | 24:00 |

The timer just has to be programmed specifically for Saturday and Sunday in the following way:

| | SATURDAY | ES9 |
|---|---|---|
| Comfort | START | STOP |
| 1. | 00:00 | 24:00 |
| 2. | --:-- | : |

| | SUNDAY | ES10 |
|---|---|---|
| Comfort | START | STOP |
| 1. | 00:00 | 24:00 |
| 2. | --:-- | : |

### 2.6.4. "QUICK HEAT-UP" FUNCTION




This function can be used when DHW is needed in a hurry and the tank is not hot enough as, for example when you return from holidays with the **PAC HT** in MAIN OFF mode or even switched off from the power supply (not recommended).

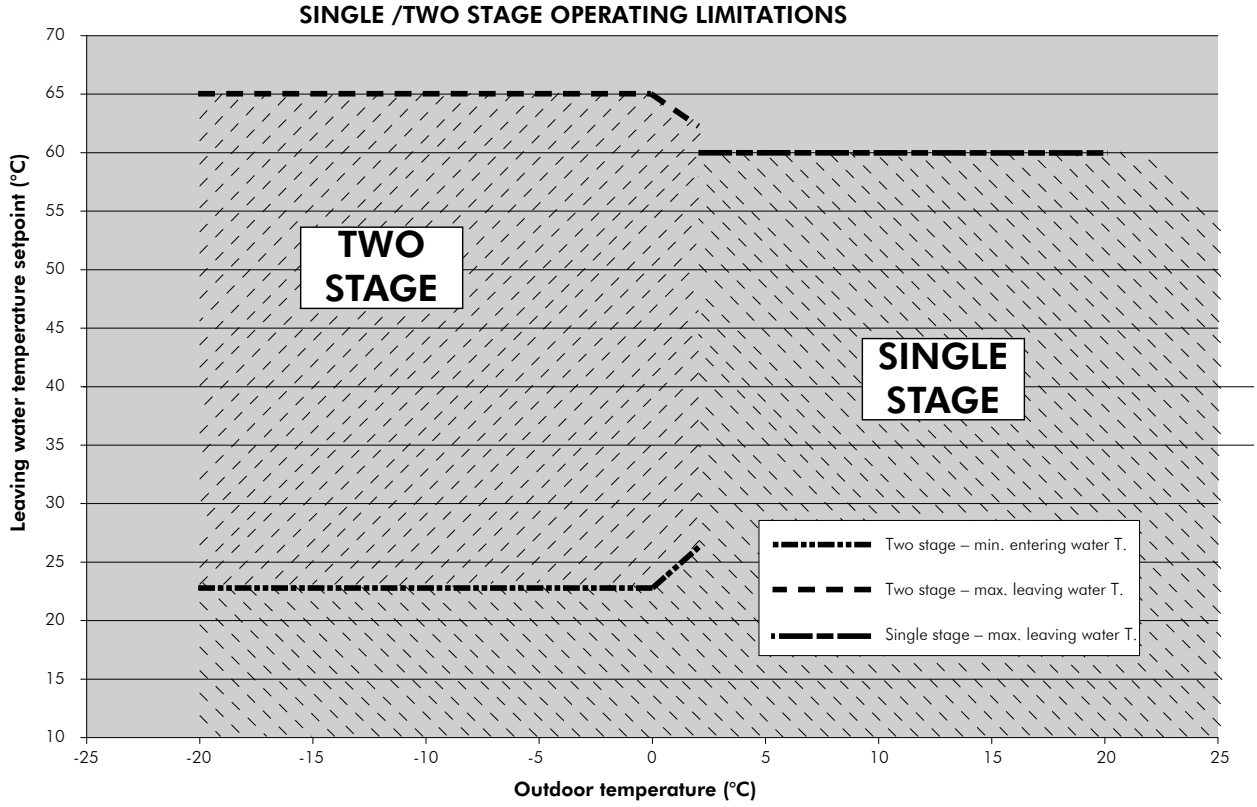
When the "QUICK HEAT-UP" function is activated, the aim is to heat the DHW as rapidly as possible. The **PAC HT**'s controller acts in the following manner :

- The system is switched to forced DHW mode, and ignores the room temperature conditions,
- The DHW setpoint changes to the Comfort setpoint, even is the current mode was Eco,
- The electric heater is authorised to start at the same time as the compressors to provide extra heating capacity (Refer to the § **ADDITIONAL ELECTRIC HEATER MANAGEMENT**, page 29).

When the DHW reaches the setpoint + 2°C (Refer to the § **DHW DEMAND**, page 21), the "QUICK HEAT-UP" function will be automatically deactivated and the **PAC HT** will return to its original operating mode.

### 2.6.5. COMPRESSOR MANAGEMENT

The operating limits of the two compressors in two stage operation are the same as in Heating mode as these are their technical limits. However, the choice between the small C2 compressor or two stage C1+C2 operation is always made to provide the best compromise between DHW temperature / capacity supplied / performance.



#### 2.6.5.1. OUTDOOR TEMPERATURE ABOVE +2°C AND UP TO +42°C

The C2 compressor operates on its own but the maximum leaving water temperature is increased to 60°C instead of 55°C in Heating mode. In this way, the **PAC HT** does not supply surplus capacity and does ensure that the hottest water possible is available under the most efficient operating condictions.

Note that DHW production is allowed up to +42°C outdoor temperature, with water produced at 60°C. Beyond 42°C outdoor temperature, the **PAC HT** will automatically shut down to avoid damaging the compressor (the same is true in Heating mode).

#### 2.6.5.2. BELOW 2°C OUTDOOR TEMPERATURE

The compressors operate in two stage mode with a leaving water temperature at 65°C. The **PAC HT** then provides its maximum capacity and maximum water temperature, while maintaining good performance. The small compressor will start operating if the entering water temperature is too low (below 23°C e.g. at a **PAC HT** start-up).

#### 2.6.5.3. COMPRESSOR NOT STARTING

In this case, as in Heating mode, if it is possible the **PAC HT** will produce DHW with the compressor which is authorised to start.

### 2.6.6. ADDITIONAL ELECTRIC HEATER MANAGEMENT

The **PAC HT** controller is capable of managing additional electric heater fitted inside the DHW tank (Refer to the example of § **LEGIONNAIRES' DISEASE PROTECTION FUNCTION**, page 30). This additional heater can be used in 4 circumstances.

#### 2.6.6.1. SET TEMPERATURE UNATTAINABLE WITH THE COMPRESSORS

When the **PAC HT** is already in DHW production mode with the compressor(s) in operation and the maximum leaving water temperature has been reached (60°C with C2 compressor or 65°C with C1+C2), the controller considers that it is no longer possible to heat the DHW via the compressors. At this point, if the DHW temperature is below the DHW setpoint minus 2°C (e.g. 55°C for a setpoint of 57°C), then the electric heater is authorised to operate until the DHW temperature reaches the setpoint. In the same time, the **PAC HT** will change back into Heating mode.

When the **PAC HT** is in Heating mode and a demand for DHW production appears, the controller estimates whether it is possible to produce DHW with the compressors. If the DHW temperature is too high, the appliance will remain in Heating mode but the electric heater will be able to operate in accordance with the previous rules. **It is for this reason, as recommended above, that it is very important not to set the DHW setpoints too high in order to avoid starting the electric heater too frequently.**

#### 2.6.6.2. LEGIONNAIRES' DISEASE PROTECTION FUNCTION

Refer to the corresponding paragraph.

#### 2.6.6.3. "QUICK HEAT-UP" FUNCTION

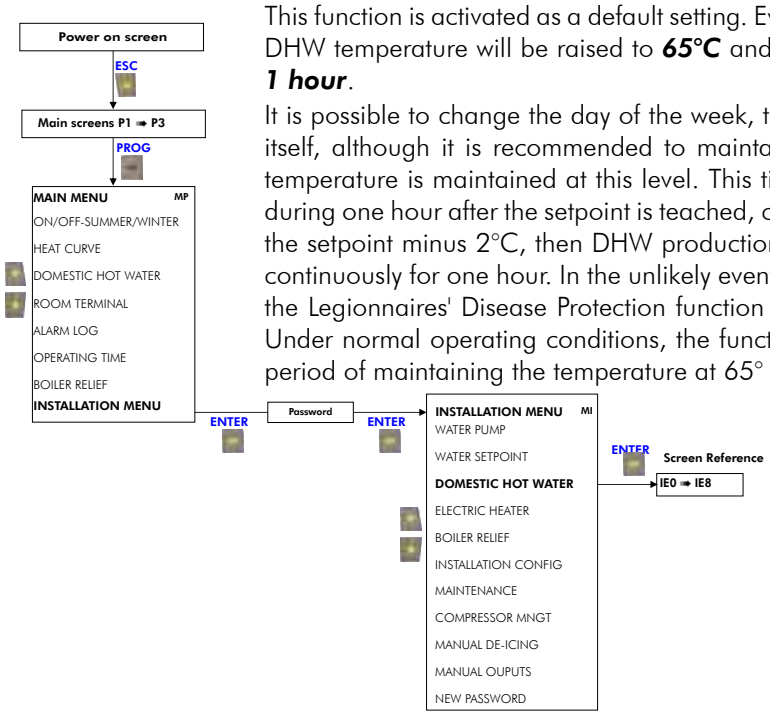
Refer to the corresponding paragraph.

#### 2.6.6.4. APPLIANCE FAULT PREVENTING START-UP OF THE TWO COMPRESSORS

If neither of the two compressors can provide DHW production, then the electric heatER will automatically take over the role with the same setpoint.

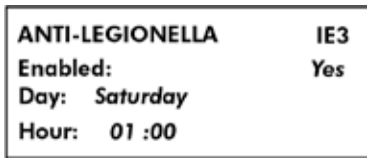
## 2.6.7. LEGIONNAIRES' DISEASE PROTECTION FUNCTION

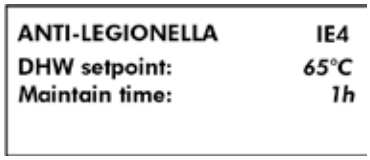
**This function requires the room terminal to be connected to the PAC HT. If the terminal has not been connected or has been disconnected for some reason, the Legionnaires' Disease protection function is deactivated.**




This function is activated as a default setting. Every ***Saturday*** at ***01h00*** in the morning, the DHW temperature will be raised to ***65°C*** and this temperature will be maintained during ***1 hour***.

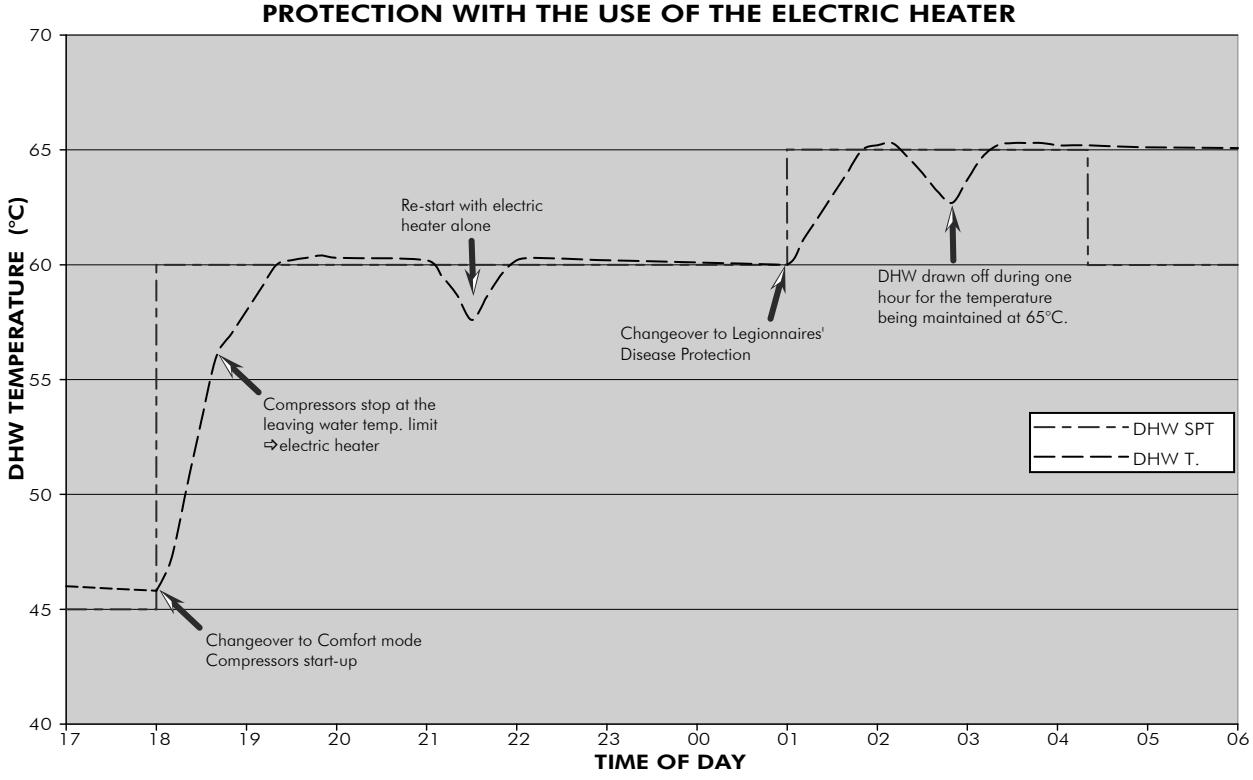
It is possible to change the day of the week, the time of the setpoint change, the setpoint itself, although it is recommended to maintain it at 65° C, and the length of time the temperature is maintained at this level. This time period means that if DHW is drawn off during one hour after the setpoint is teached, causing the DHW temperature to drop below the setpoint minus 2°C, then DHW production will restart until the setpoint is maintained continuously for one hour. In the unlikely event of this sequence re-occuring several times, the Legionnaires' Disease Protection function will automatically deactivate after 5 hours. Under normal operating conditions, the function is deactivated at the end of the 1 hour period of maintaining the temperature at 65° C.



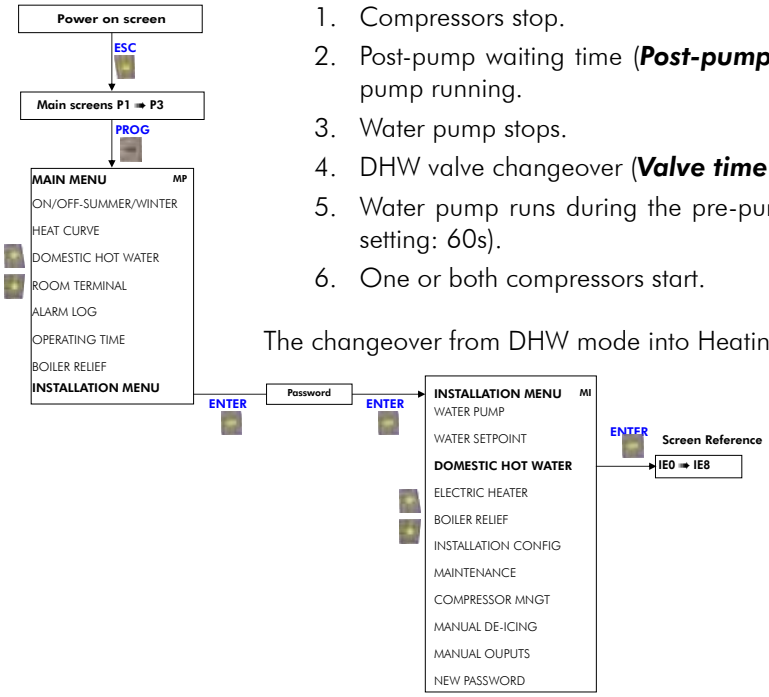

If it is intended to use this function, an electric heater **must** be fitted as it is the only way to attain the required DHW temperature.

**EXAMPLE OF DHW PRODUCTION AND OPERATION OF THE LEGIONNAIRES' DISEASE PROTECTION WITH THE USE OF THE ELECTRIC HEATER**



### 2.6.8. HEATING ⇆ DHW CHANGEOVER

When the **PAC HT** changes from Heating mode to DHW mode, the following sequence of events occurs:




1. Compressors stop.
2. Post-pump waiting time (***Post-pump time***, Default setting: 60s) with the water pump running.
3. Water pump stops.
4. DHW valve changeover (***Valve time***, Default setting: 90s).
5. Water pump runs during the pre-pump waiting time (***Pre-pump time***, Default setting: 60s).
6. One or both compressors start.

The changeover from DHW mode into Heating mode occurs in the same manner.

When the valve position changes, the water pump is stopped to avoid mixing the two Heating and DHW circuits, even though it is a joint circuit. In this way, especially in summer when the Heating is stopped, cold water is prevented from being dispatched to the DHW tank (Heating ➠ DHW) or from the hot water tank to the cold Heating circuit (DHW ➠ Heating). The aim is to maximise the system's overall performance and user comfort.

The time for valve changeover, stop or not of the water pump, and the post and pre-pump time settings, can be changed via the screens IE6 and IE7.

When the **PAC HT** is actually changing from Heating mode to DHW mode, it displays "***No room need***" on the main screen P1. In the event of doubt about actual appliance operating status, the moving icon is displayed on the right of screen P2. If the **PAC HT** is producing DHW with the electric heater, this icon will not appear as it is associated with the changeover of the DHW valve (refer to the green warning light on the DHW tank supplied as an option).

In the case where the DHW tank used is not the model available as an option, it is possible that the **PAC HT** changes to DHW mode but is unable to start the compressor(s) due to excessively high appliance entering water temperature. In this case, the **PAC HT** will remain in DHW mode for 15 minutes (in case the entering water cools down enough for the compressor(s) to start) and will then change to Heating mode for at least 30 minutes while activating the electric heater. This avoids the appliance constantly changing from one mode to the other in case of continuous a demand for DHW (possible if the DHW temperature sensor is placed incorrectly.

## 2.7. INLINE ELECTRIC HEATER

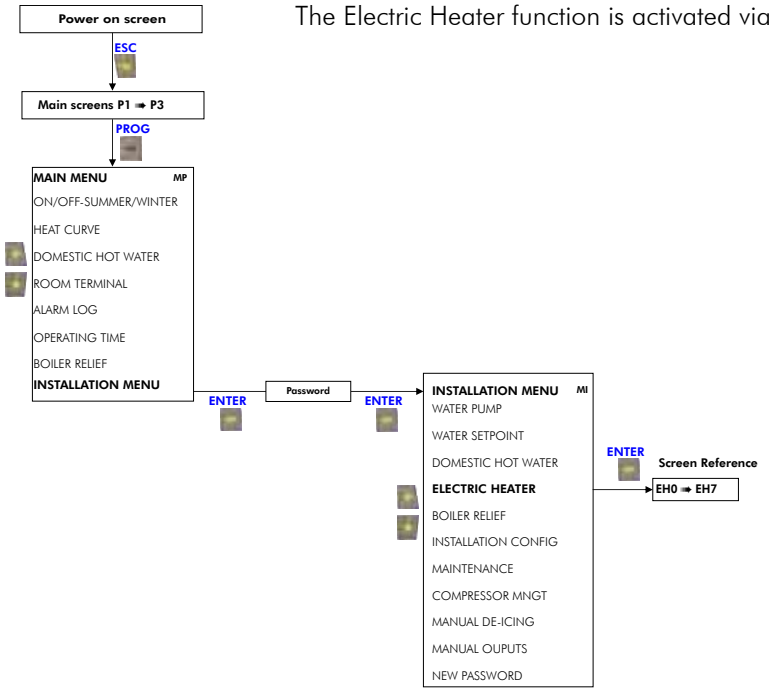
The inline electric heater is an option of the **PAC HT** that is not equipped with an integrated heater.

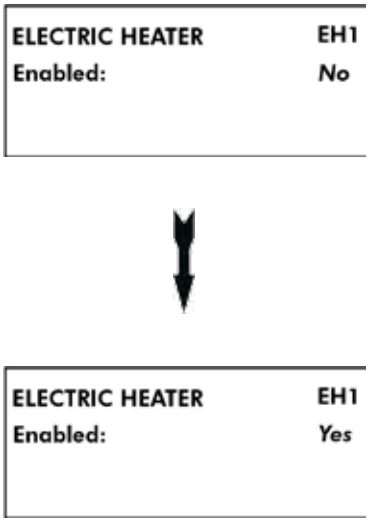
The **PAC HT**'s controller can manage 2 electric heating stages in 2 different modes: "Emergency only" and "Back-up + Emergency".

It is not possible to connect or activate simultaneously the Electrical Heater and the Boiler Relief functions as they use the same digital outputs.

### 2.7.1. ELECTRIC HEATER FUNCTION ACTIVATION

The Electric Heater function is activated via screen EH1 in the Installation menu.



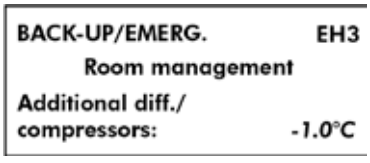

### 2.7.2. EMERGENCY AND BACK-UP + EMERGENCY COMMON FUNCTIONS

These two operating modes have relatively different management systems (see the § dedicated to each mode) but some functions are common to both modes. They are identified under "**BACK-UP/EMERG.**" in the Electric heater menu screens.

#### 2.7.2.1. MANAGEMENT BY ROOM TEMPERATURE

The aim of this function is, as a default setting, not to use the electric heaters as the compressors are used, as they are intended to guarantee maximum comfort and energy savings.

Electric Heater management via the room temperature is linked to compressor management (Refer to the § **PAC HT ON/OFF CONTROL BY ROOM TEMPERATURE**, page 13).



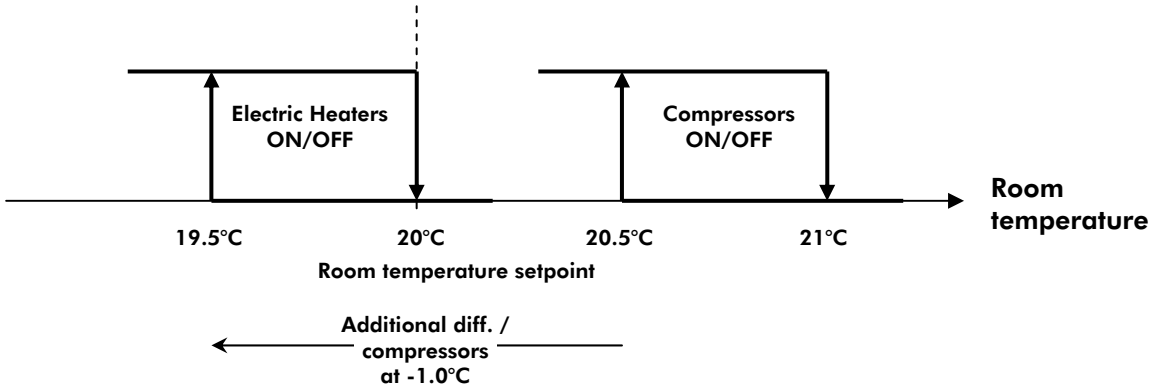

The ***Additional diff./compressors*** parameter offsets the ON/OFF room setpoint of the electric heaters from that of the compressors.

Increasing this parameter (e.g. to -2.0°C) will reduce user comfort slightly but will also reduce electricity consumption. Changing it to 0°C will guarantee maximum comfort but can significantly increase electricity consumption.

**Example**

For a room temperature setpoint at 20°C with the parameters ***Stop diff./SPT*** and ***Start diff./SPT*** at their original settings (respectively 1.0°C and 0.5°C) and ***Additional diff./compressors*** at -1.0°C:

- The electric heaters will be authorised to start if room temperature < 19.5°C.
- The electric heaters will stop if room temperature > 20°C.
- The compressors will be authorised to start if room temperature < 20.5°C.
- The compressors will stop if room temperature > 21°C.




**Just as for boiler relief, the room temperature management is entirely deactivated when the room terminal is not connected. Accordingly, we strongly advise you to install it.**

### 2.7.2.2. MANAGEMENT BY WATER TEMPERATURE

| BACK-UP/EMERG. | EH6 |
|---|---|
| Start diff.: | -3.0°C |
| Stop diff. S2: | -1.0°C |
| Stop diff. S1: | 0.0°C |

The overall logic is that the electric heaters should operate for the shortest possible time while enabling the required water temperature to be reached (comfort optimisation), without it being exceeded (unnecessary electricity consumption).More over, the stop sequence of the electric heaters in relation to water temperature is offset, favouring the single-stage operation (i.e. the less powerful of the two stages) in addition to the compressors and avoiding unnecessary electricity consumption.

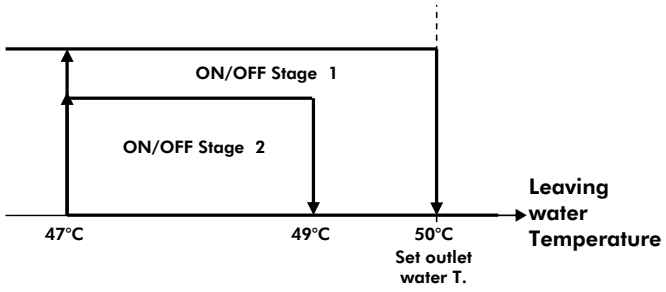
3 parameters define operation of the 2 electric stages in relation to the leaving water temperature setpoint:

- ***Start Diff.***

  Both heater stages are authorised to start if:

  Leaving water T. < Leaving water setpoint + ***Start diff.***

  For a setpoint at 50°C, the heater stages are authorised to start if Leaving water T. < 47°C.




- ***Stop diff. S2***

  The second heater stage (normally the most powerful stage in the case of an unequal two-stage set-up: 2kW + 4kW) will stop if:

  Leaving water T. > Leaving water setpoint + ***Stop diff. S2***

  For a setpoint at 50°C, the 2nd heater stage will stop if Leaving water T. > 49°C.

- ***Stop diff. S1***

  The first stage of the heater will stop if:

  Leaving water T. > Leaving water setpoint + ***Stop diff. S1***

  For a setpoint at 50°C, the 1st heater stage will stop if Leaving water T. > 50° C.

### 2.7.2.3. LEAVING WATER TEMPERATURE LIMITATION

| | |
|---|---|
| BACK-UP/EMERG. | EH7 |
| Max. leaving limit enabled (70°C): | *Yes* |

The controller can manage (function activated as a default setting) the electric heater's leaving water temperature (in a theoretical manner, given there is no electric heaters leaving water sensor).

The controller considers that the heaters supply a capacity equivalent to that of the small compressor and therefore takes this ΔT as a reference value (Default: 5°C).

In this case, the leaving water temperature of the heaters running at full capacity = **PAC HT** leaving water T. + ΔT C2 small compressor.

➢ The electric stages are authorised if:

**PAC HT** leaving water T. < 70°C – ΔT C2 – 4°C

➢ The electric stages are deactivated if:

**PAC HT** leaving water T. > 70°C – ΔT C2 – 2°C

In the case where the water flow in the electric heaters varies greatly from that of the **PAC HT** (in the case of a mixing tank with the heater on the heating loop), it is preferable to deactivate this function, as the ΔT C2 no longer corresponds to that of the heaters.

### 2.7.2.4. SPECIAL FEATURES OF THE EMERGENCY ONLY MODE

| | |
|---|---|
| ELECTRIC HEATER | EH2 |
| Mode: | *Emergency only* |

The Emergency only mode is the default setting.

In this mode, the electric heaters are not allowed to start on their own, but only after activation of the ICS input (marked ID4 on the controller. - Refer to the wiring diagrams) and then only in the event of a major alarm on the **PAC HT**. This digital input corresponds to the Emergency button on the heater and that should be connected the appliance.

When the button on the electric heater is activated it does not force the electric stages to operate but it communicates to the controller that the Emergency mode is requesting by the user. The electric stages are always managed by the controller.

**This action will generate an "information alarm" AL36 for information purposes only. This alarm message will disappear automatically when the heater button is deactivated.**

#### 2.7.2.4.1. MINIMUM OPERATING TIME

In Emergency mode, the start of the electric heaters is not linked to compressor operation and no outdoor temperature condition is required.

| | |
|---|---|
| EMERGENCY | EH4 |
| Min. ON time | |
| Comp.-> stage1 : | -- |
| Stage 1 -> 2 : | *20min* |

When the room and water temperature conditions are both active and when the Emergency button is activated, the first electric stage can start straightaway.

On the other hand, the operation of the second electric heater is related to the operating time of the first stage. This has to operate for a period of ***Stage 1 -> 2*** (Default setting: 20 minutes) before the other stage can start.

### 2.7.2.5. BACK-UP+EMERGENCY MODE SPECIAL FEATURES

#### 2.7.2.5.1. CHANGEOVER FROM EMERGENCY ONLY MODE TO BACK-UP + EMERGENCY MODE

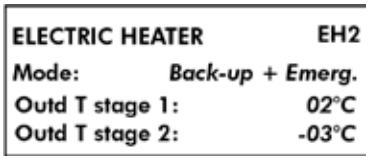
Back-up mode leaves electric heaters management under fully automatic control. But, the Emergency mode can always be activated via the button on the heater, but this would suppose a fault on the **PAC HT**. In this case, the special features of the Back-up mode are cancelled and the electric stages are managed according to Emergency only mode rules.

For this reason, the Back-up mode is actually a Back-up + Emergency mode.

#### 2.7.2.5.2. MANAGEMENT BY OUTDOOR TEMPERATURE

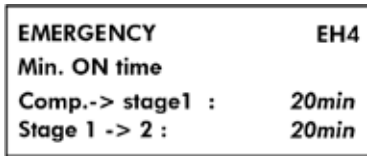
In Back-up mode, the two electric stages are managed separately using the outdoor temperature. Therefore it is important to know the approximate balance point for each stage (i.e. the outdoor temperature below which electric heating capacity is required to overcome heat losses from the house).

As a default setting, the 1st stage (2kW) starts below 2°C outdoor temperature, while the 2nd stage (4kW) starts below -3°C.




#### 2.7.2.5.3. MINIMUM OPERATING TIME

The difference compared to the Emergency mode is that the 1st stage is related to a compressor operating time. The 2nd stage is always authorised after the 1st stage has been operating for the time ***Stage 1 -> 2*** (Default setting: 20 minutes).




Under normal operating conditions

The compressor operating time ***Comp. -> Stage 1*** corresponds to full capacity operation (two stages or large compressor only). No time is counted when the C2 compressor operates on its own insofar as the **PAC HT** first has to detect automatically a lack of capacity and switch to full capacity operation. The compressor operating time is reset to zero when a compressor stops (except for de-icing mode).

If a compressor does not start

There is an exception in the case of a compressor not starting. In this event, the operating time of the remaining compressor is taken into account.

In the case of de-icing mode

In the case of de-icing, as the compressors stop operating (Refer to the § **DE-ICING**, page 45) and would therefore also stop electric heaters operation, the compressor operating time is not reset to zero. It is neither counted down during de-icing.

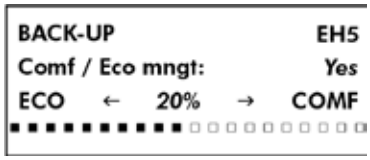
There are two possibilities during a de-icing procedure:

- If the compressor operating time was less than 20 minutes, then when the compressors restart in Heating mode after the end of the de-icing procedure, the countdown will also restart and the electric stages will be able to restart rapidly.
- If the compressor operating time was already over 20 minutes, the 1st stage (or even the 2nd) was already also in operation and therefore will not be stopped during de-icing.

### 2.7.2.5.4. COMFORT / ECONOMY SETTINGS

This function can be deactivated via screen ***EH5***.

Its purpose is to avoid using the electric heaters when the compressor capacity alone is sufficient to heat-up the Heating circuit. This is particularly useful in the case of lower night time temperatures when the **PAC HT** restarts with a loop of cold water. In this way, the electric heaters will only be called upon if the controller detects an excessively slow rise in water temperature.



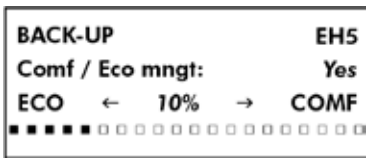

Default setting: 20% (the best compromise between Economy and comfort) means that the appliance will only authorise the electric heaters to restart if the compressor capacity is not above 120% of the housee's heat losses. In other words, if the compressors supply at least 20% more capacity than is needed to heat the residence, then they are going to operate on their own without the help of the electric stages.

**Example**

If the residence has a heat loss of 10kW, the electrical heater will only start if the compressors supply less than 12kW (20% more than 10kW). Above 12kW, it is considered that the difference is enough to raise the Heating circuit water temperature.

Reducing the percentage -> ECO

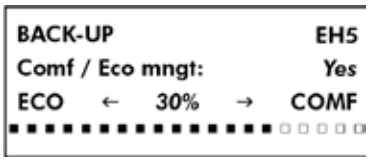
Reducing the percentage (e.g. to 10%) will authorise the electric heaters to start at a later stage and will provide energy savings, but to the detriment of comfort. We advise against this parameter being reduced in case of big difference between night abd day setpoint. Moreover, this reduction would be pointless in terms of electricity consumption savings, as the electric heater would enter into operation.




However, this percentage can be reduced when the installation contains a water volume greater than the recommended volume (between 200 and 250 L).

Increasing the percentage -> CONF

Increasing the percentage (e.g. to 30%) will authorise the electric heaters to start at an earlier stage and will provide greater comfort, but to the detriment of energy savings.




### 2.7.2.5.5. ELECTRIC HEATERS OPERATION IN THE CASE OF AN ALARM ON THE PAC HT

In the event of a fault on the **PAC HT**, and if the electric heaters has sufficient capacity, it is possible that the user does not become aware of the problem, as the heater takes over from the compressors. In addition, some functions are no longer valid if a compressor is in alarm mode. For this reason, the logic is altered slightly if an alarm is detected by the controller:

- The Comfort/Economy function is deactivated.
- The compressor operating time is no longer taken into account.
- In order to warn the user, while ensuring an adequate level of comfort, the leaving water setpoint is automatically lowered by 10°C for a Radiators configuration and by 5°C for a Floor Heating configuration. In this way, the system forces a slightly lower level of comfort. It is important not to force the stop of the electric heaters in the event of an extended absence, even if this leads to higher electricity consumption, as in this case the residence's anti-freeze protection will no longer be guaranteed.

In the event of a fault that cannot be reset (compressor fault, temperature sensor failure…), we recommend that the Emergency mode is activated via the button on the electric heater.

## 2.8. BOILER RELIEF

The Boiler relief function does not require an additional control module. The **PAC HT** can manage both dry contact boiler operation control and a 230V directional valve changeover contact (Refer to the PAC HT's wiring diagrams).

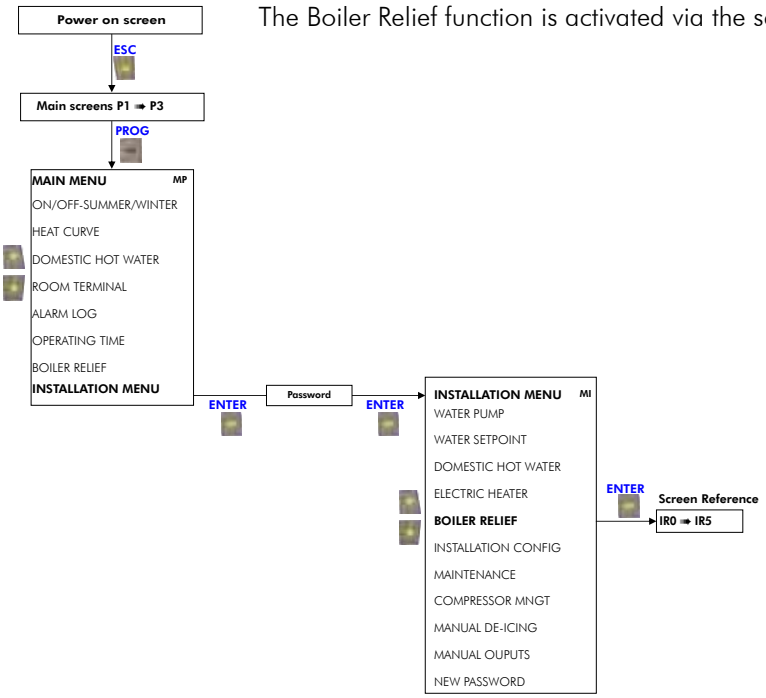
The logic always favours **PAC HT** operation, while guaranteeing optimum comfort. The stop of the appliance will be driven only by the maximum water temperature limit (65°C).

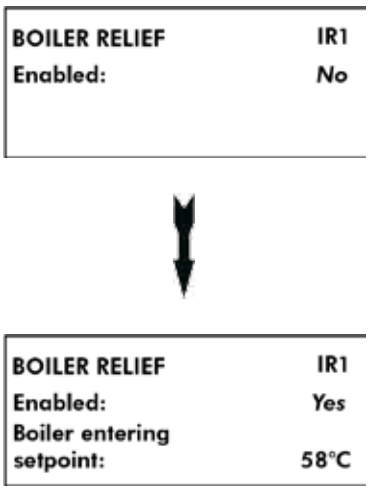
As in the case of the electric heaters, an Emergency mode is available.

It is not possible to connect or activate simultaneously the Electric Heaters and the Boiler Relief functions, as they use the same digital outputs.

### 2.8.1. BOILER RELIEF FUNCTION ACTIVATION

The Boiler Relief function is activated via the screen IR1 in the Installation menu.

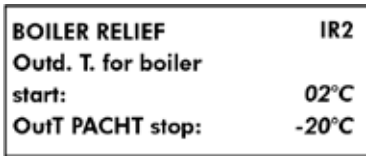



### 2.8.2. BOILER RELIEF MANAGEMENT

#### 2.8.2.1. MANAGEMENT BY OUTDOOR TEMPERATURE

The activation of the boiler is directly related to the outdoor temperature by the balance point, ***Outd. T. for boiler start*** The default setting is 2°C. Above this outdoor temperature, the boiler will not be activated automatically.



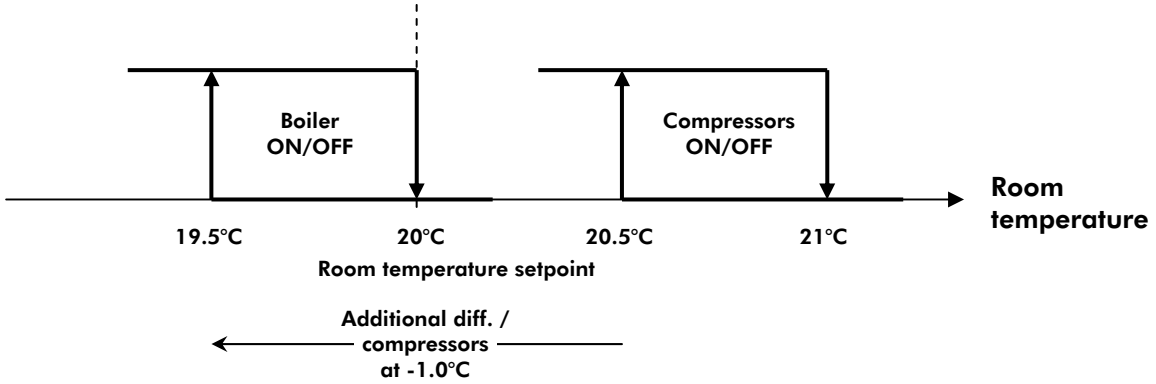

It is also possible to set an outdoor temperature for the **PAC HT** to stop, i.e. ***OutT PACHT stop*** The default setting is -20°C. Below this outdoor temperature, the appliance will be stopped automatically and the boiler will operate on its own.

The value of -20°C ensures that the **PAC HT** is always authorised to operate, particularly as it has been designed to operate at such low temperature conditions. Therefore, as opposed to a traditional heat pump that would be shut down at -5°C outdoor temperature, there is no benefit to stop the **PAC HT** earlier. However, the controller does provide for this possibility.

### 2.8.2.2. MANAGEMENT BY ROOM TEMPERATURE

Refer to the section Management by Room Temperature in the § **EMERGENCY AND BACK-UP + EMERGENCY COMMON FUNCTIONS**. Boiler management by room temperature is identical.

| BOILER RELIEF | IR3 |
|---|---|
| Room management | |
| Additiona Diff.l / compressors: | -1.0°C |




Compared with the electric heater, as the Boiler Relief function is not dependent on a compressor operating time, a minimum demand time via the room temperature has been added. This is the ***Minimum time on demand*** and the default setting is 30 minutes.

| BOILER RELIEF | IR4 |
|---|---|
| Minimum time on demand: | *30min* |

In the previous example, the boiler is considered to be in demand when the room temperature is below a value between 19.5°C et 20°C (depending of the change in the temperature).

**Just as for electric heater, the room temperature management is entirely deactivated when the room terminal is not connected. Accordingly, we strongly advise you to install it.**

### 2.8.2.3. MANAGEMENT BY HEAT CURVE

It is also possible to manage a heat curve for the boiler. This function is enabled as a default setting and can be disabled via the screen IR5 in the Installation menu.

In this case, the system considers that the leaving water temperature of the **PAC HT** is the same as the boiler entering temperature (case of a direct circuit from the **PAC HT** to the boiler). However, since there is no temperature sensor on the boiler outlet the boiler leaving temperature is calculated on the basis of the **PAC HT** leaving temperature and a theoretical boiler temperature difference, the ***Boiler delta T***. The default delta T is set at 15°C:

| BOILER RELIEF | IR5 |
|---|---|
| Heat curve: | *Yes* |
| Boiler delta T: | *15°C* |
| Start Diff.: | *05°C* |

Boiler Entering setpoint = Heat curve setpoint – ***Boiler Delta T***

The boiler setpoint is displayed on the first screen of the Boiler Relief menu IR1.

| BOILER RELIEF | IR1 |
|---|---|
| Enabled: | Yes |
| Boiler entering setpoint: | 58°C |

The boiler stops when the **PAC HT** leaving water temperature reaches the boiler setpoint. It restarts at Boiler setpoint – ***Start diff.*** (Default setting: 5°C).

The major difference between the Heat curve used by the boiler and by the **PAC HT** (for the compressors) is that it is not self-limited at 65°C but extended for as long as neededbe. If the heat curve asks for 85°C (e.g. at -15°C outdoor temperature, albeit an extreme case), the boiler setpoint will be 70°C (85°C – 15°C).

**Example**

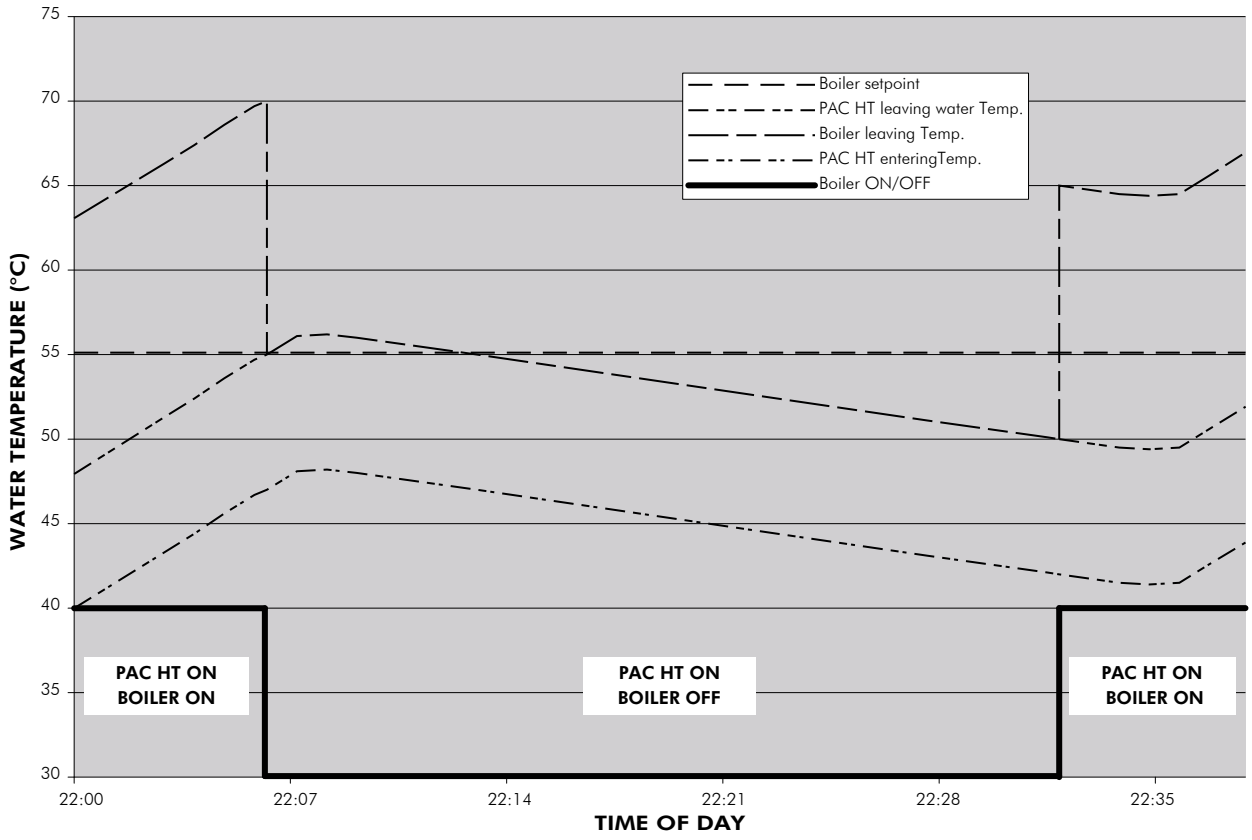
At an outdoor temperature of -10°C, the heat curve asks for 70°C in the radiators (case of a setting at 65°C with -7°C outdoor temperature). The **PAC HT** heat curve is then limited at 65°C and the boiler setpoint is at 55°C (70°C-15°C).

Installation :

Water volume: 250L, residence heat losses: 17kW. A **PAC HT 18-9** model supplies 12.5kW (at -10°C) and the boiler installed supplies 24kW. This means that with the **PAC HT** alone, there is a deficit of 4.5kW (12.5kW - 17kW, therefore the water slowly cools down) and with the **PAC HT** + boiler, there is a surplus of 19.5kW (12.5kw + 24kW - 17kW, therefore the water heats up very quickly).

Note : We do not take into account the radiators' emissivity (that changes the capacity restored to the circuit in relation to the water temperature).

**In this example, the PAC HT always remains in operation whereas the boiler operates cyclically.**




### 2.8.2.4. BOILER RELIEF OPERATION IN THE EVENT OF AN ALARM ON THE PAC HT

In the event of a fault on the **PAC HT**, just as with the electric heater, it is possible that the user does not become aware of the problem as the boiler substitutes itself for the compressors. For this reason, the logic is altered slightly if an alarm is detected by the controller:

> In order to warn the user, while ensuring an adequate level of comfort, the leaving water temperature is automatically lowered by 10°C for a Radiators configuration and by 5°C for a Floor Heating configuration. In this way, the system forces a slightly lower level of comfort. It is important not to force the stop of the boiler in the event of an extended absence, even if this leads to higher consumption, as in this case the residence's anti-freeze protection will no longer be guaranteed.

There is an exception to this rule in case of a Peak Energy Day (Refer to the following §).

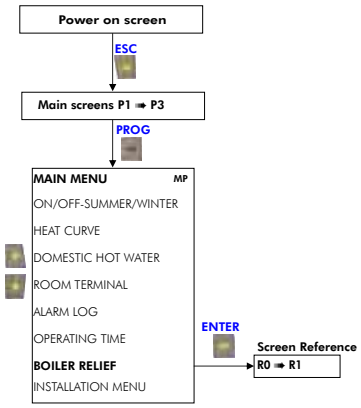
**If the "Lack of water flow" (AL6) alarm is triggered, the boiler is also stopped.**

### 2.8.2.5. PEAK ENERGY DAY CASE (USE OF THE ON/OFF INPUT)

In the event of an alarm on the **PAC HT**, and if the ON/OFF input forces the **PAC HT** to stop and the boiler to operate (case of a Peak Energy Day), then there will be no water setpoint offset.

When the Peak Energy Day input (or ON/OFF) is activated, the law driving the outdoor balance temperature (Default setting: 2°C, Refer to the § **MANAGEMENT BY OUTDOOR TEMPERATURE**, page 37) of boiler substitution) no longer applies. The boiler is then authorised to operate at any outdoor temperature. Refer to the § **PEAK ENERGY DAY CONFIGURATION**, page 8 for further details.

### 2.8.2.6. EMERGENCY MODE




In Emergency mode, just as in the case of Peak Energy Day, the law driving the outdoor balance temperature is deactivated. However, heat curve and room temperature managements are still active.

There are two ways of forcing boiler relief in Emergency mode:

- Via the ICS input (marked ID4 on the controller). This digital input normally corresponds to the Emergency button present on the electric heater and therefore it is necessary to connect it to the appliance via a switch in the case of boiler relief (refer to the wiring diagrams).
- Via the display. A part of the main menu is devoted to this purpose in the event where the ICS input is not connected. You just have to change the parameter on screen R1 from NO to YES.

Activating the Emergency mode does not directly force boiler operation but it communicates to the controller that the Emergency mode is requested by the user.

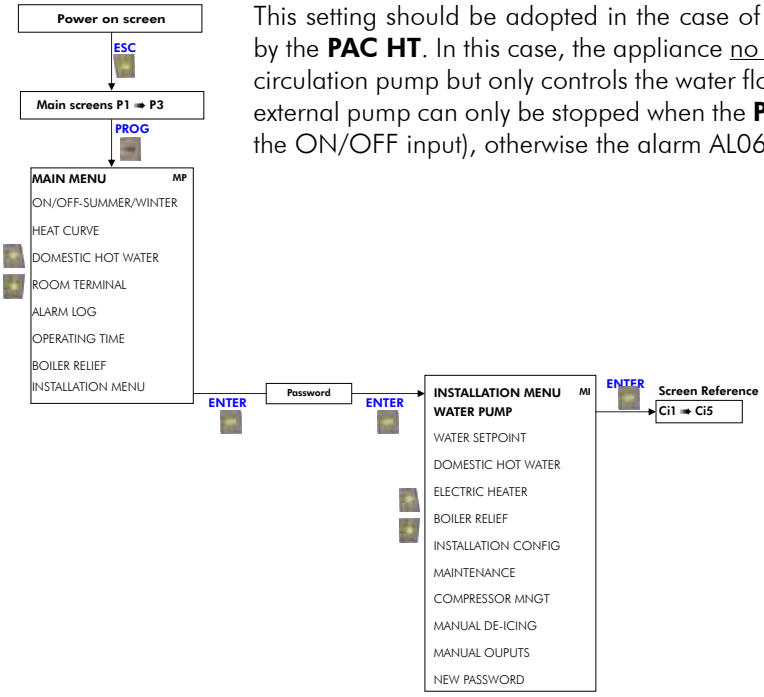
**This action will generate an "information alarm" AL36 for information purposes only. This alarm message will disappear automatically when the Emergency mode is deactivated.**

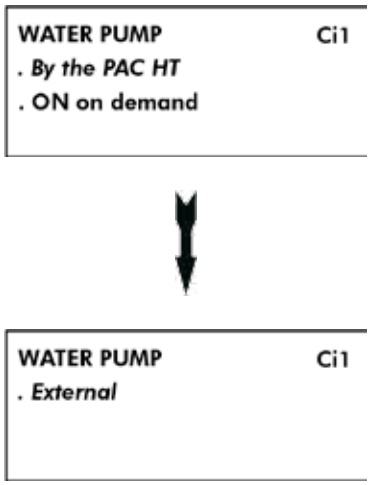
# 3. OTHER FUNCTIONS

## 3.1. WATER PUMP MANAGEMENT

It is possible to manage the water pump operation in two different ways.

### 3.1.1. EXTERNAL




This setting should be adopted in the case of an outdoor circulation pump not managed by the **PAC HT**. In this case, the appliance no longer manages the ON/OFF control of the circulation pump but only controls the water flow when the machine is "ON". Therefore, the external pump can only be stopped when the **PAC HT** is "OFF" (via the appliance screen or the ON/OFF input), otherwise the alarm AL06 "Lack of water flow"" will appear.

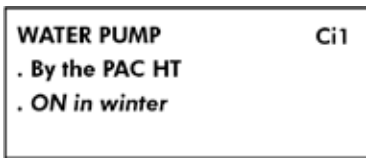
The water flow detection starts from the moment when the **PAC HT** is ON. Any interruption in water flow will cause the complete stop of the appliance until the alarm is manually reset.

### 3.1.2. PUMP ENTIRELY MANAGED BY THE PAC HT

This is the default parameter setting. In this case, the **PAC HT** manages the ON/OFF, Anti-Freeze and Anti-Seize functions.

#### 3.1.2.1. OPERATING MODES

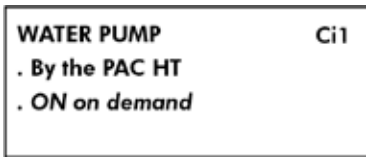
##### 3.1.2.1.1. ON IN WINTER




This is the default parameter setting. The pump is stopped when the **PAC HT** is OFF or in Summer mode and is operating the rest of the time.

Therefore, the principle is to keep the pump operating during the entire heating period (even if the room temperaturecontrol is not on demand) and to shut it down for the rest of the year to make energy savings.

##### 3.1.2.1.2. ON ON DEMAND




This parameter setting offers maximum energy savings. The pump management is based on the ***ON in Winter mode***, but the room conditions are also taken into account. When the room temperature control is no longer on demand, the pump is stopped.

Special attention must be given to the hydraulic circuit. In fact, the pump can make quite frequent ON/OFF cycles (short-cycling) and this may generate unwelcome noises in the pipes each time the pump restarts (e.g. due to the presence of air in the circuit).

This parameter setting is especially recommended in the case of major heat contributions from other sources (e.g. an open fire). In this way, the pump will stop on its own when the room temperature setpoint is exceeded and this will avoid the volume of water in the buffer tank from cooling down and will facilitate the restarting of the Heating circuit (which can take some time when the installation's entire water volume is at the room temperature).

3.1.2.1.3. ALWAYS ON

The pump starts operating as soon as the power to the **PAC HT** is switched on, and it never stops.

| | |
|---|---|
| **WATER PUMP** | **Ci1** |
| **. By the PAC HT** | |
| ***. Always ON*** | |

### 3.1.2.2. WATER FLOW DETECTION

The controller checks the presence of a continuous water flow after the pump has operated for at least 25 seconds. Any interruption in water flow will cause the complete stop of the appliance until the alarm is manually rearmed.

### 3.1.2.3. TIME DELAYS

Two time delays control the pump operation.

➢ ***Pre-pump time***

Default setting 120 seconds. When it is managed by the **PAC HT**, this is the minimum pump operating time before the compressors are authorised to start, irrespective of the operating mode selected on screen Ci1.

| | |
|---|---|
| **Pre-pump** | **Ci2** |
| **time:** | ***120s*** |
| **Post-pump** | |
| **time:** | ***300s*** |

➢ ***Post-pump time***

Default setting 300 seconds. When the pump has to stop, this is the minimum operating time after the compressors have stopped.

### 3.1.2.4. ANTI-FREEZE

Refer to the § **ANTI-FREEZE FUNCTION**.

### 3.1.2.5. ANTI-SEIZE

With this function, when the pump has been stopped for a long time, the **PAC HT** controller starts it operating at regular intervals (***Off time***, Default setting 23h) and for a set time (***On time***, Default setting 120 s). In this way, the circulation pump never remains too long without operating and there is therefore no need for it to be un-seized when the Heating installation is put back into service (typically when restarting in the autumn after the summer).

| | |
|---|---|
| **WATER PUMP** | **Ci5** |
| **ANTI-SEIZE** | |
| **Off time:** | ***23h*** |
| **On time:** | ***120s*** |

### 3.2. ANTI-FREEZE FUNCTION

**When the PAC HT is powered on**, it automatically protects itself against the risk of freezing.

Only two parameters have to be configured: ***Min Water T.*** (Default setting 6°C) and ***Differential*** (Default setting 5°C).

| | |
|---|---|
| WATER PUMP | Ci3 |
| ANTI-FREEZE | |
| Min water T.: | 06.0°C |
| Differential: | 5.0°C |

#### 3.2.1. WATER PUMP

When the pump is not operating, the **PAC HT** continuously CHECKS the water temperature (the lower temperature between the water entering and leaving temperatures) in order to restart the pump if needed:

- Minimum (Water entering, leaving) ≤ ***Min water T.*** → water pump starts
- Minimum (Water entering, leaving) ≥ ***Min water T.*** + ***Differential*** → water pump stops

If there is a fault on the water entering sensor, ***Min water T.*** is offset by 4°C (therefore the default setting becomes 10°C) to ensure that the anti-freeze function operates based on the leaving water temperature (the hottest as it is at the top of the plate heat exchanger).

In the event of a simultaneous fault on both water temperature sensors, the pump is forced to operate continuously.

#### 3.2.2. PLATE HEAT EXCHANGER PROTECTION

The plate heat exchanger is protected against freezing by an electric heater affixed to one side. This resistance is activated via a mechanical pipe circuit thermostat when the latter detects a water temperature below 3°C.

#### 3.2.3. COMPRESSOR MANAGEMENT

The compressors are not authorised to start if leaving temperature < ***Min water T.***

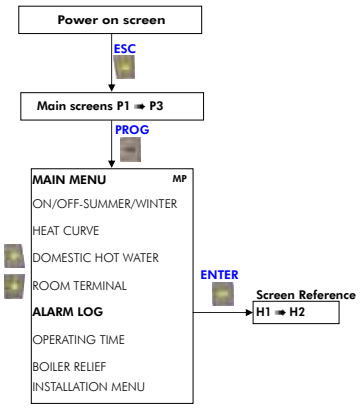
When the compressors are operating, they are forced to stop if leaving temperature < ***Min water T.*** – 1°C.

During an installation start-up and if the water temperature in the Heating circuit is lower than 6°C, it is always possible to reduce ***Min water T.*** (minimum value -15°C) in order to be able to start the compressors.

**If the PAC HT circuit water does not contain glycol, we strongly advise against setting Min water T. below 6°C. In order to warn the user of the absolute necessity of adding glycol if *Min Water T.* < 3°C, another screen Ci4 appears when exiting screen Ci3. This screen offers the possibility of changing this parameter after the fact.**

| | |
|---|---|
| WATER TEMP. | Ci4 |
| ANTI-FREEZE < 3°C | |
| - GLYCOL REQUIRED - | |
| VALIDATE: | 2.9°C |

### 3.3. ALARM LOG




The **PAC HT** controller has a very complete alarm log that stores the last 150 alarms and their codes, the chronological number, the time of occurrence, the time lapse between each alarm, and the description of the fault. On another screen (H2), there are the 4 temperatures (Outdoor, Water entering and leaving and Coil temperatures) read at the moment the alarm appears.

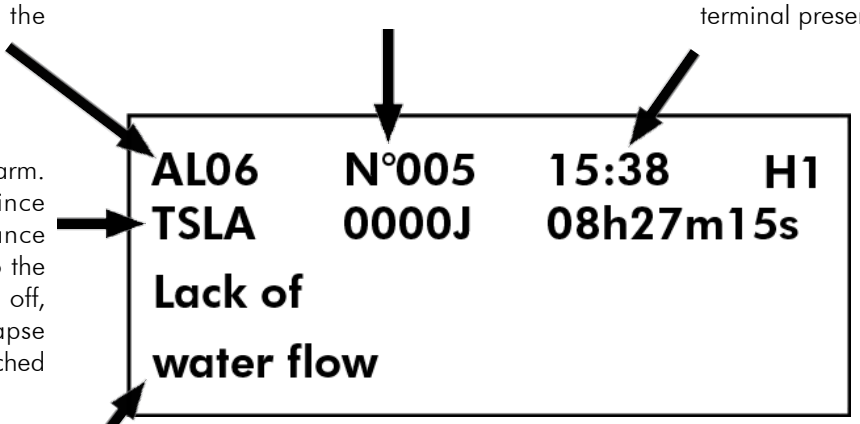
#### 3.3.1. H1

Alarm code, ALxx, identical to the code displayed on the alarm screen (alarm key) and on the room terminal Err xx.

Alarm number in the log by order of appearance.

Time of alarm appearance (if room terminal present).

**TSLA** for **T**ime **S**ince **L**ast **A**larm. This is the time elapsed since the previous alarm (appliance powered on). If the power to the **PAC HT** has been switched off, TSLA represents the time lapse since the power has been switched back on.




Alarm description, similar to the one displayed on the alarm screen (alarm key).

It is possible to scroll through the alarms by order of appearance via the UP and DOWN arrows. The first alarm in the log is the oldest and the last one is the most recent.

In the above example, the alarm code **AL06** is the ***5th*** to appear on this **PAC HT** and therefore the 5th in the log. It appeared at **15h38** (time read on the room terminal), 8 hours, 27 minutes and 15 seconds after the previous alarm. This alarm is the one for "***Lack of water flow***".

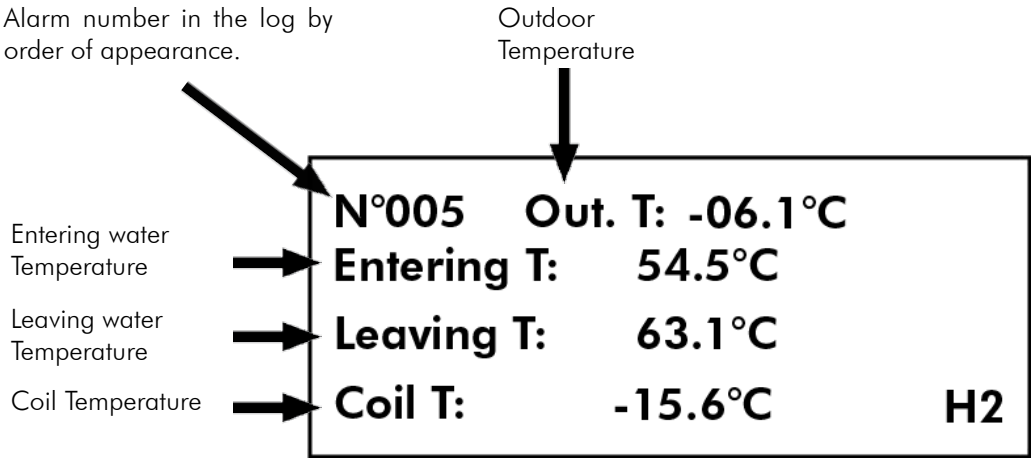
A TSLA of 1 second indicates that the alarm occurred at the same time as the previous alarm but it is stored in the log with the following sequence number and at a 1 second interval.

The time used in the log is provided by the room terminal. Therefore it is important to install this terminal to have an accurate log.

### 3.3.2. H2

The second screen of the log (H2) is accessible via the ENTER key on the screen H1.

On the H2 screen all the **PAC HT** temperature sensors are displayed with the values recorded exactly at the time of appearance of the alarm.

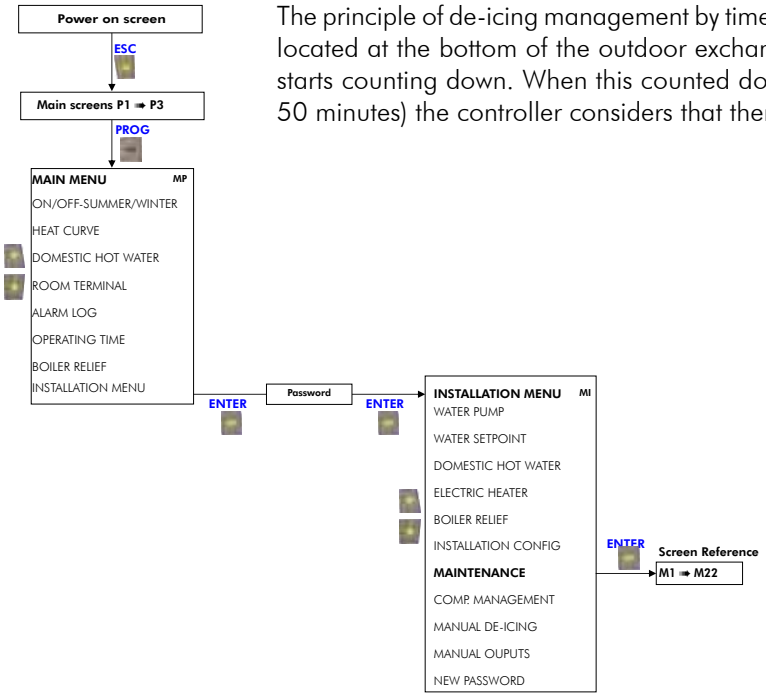



Return to screen H1 by pressing the ENTER key .

## 3.4. DE-ICING

The **PAC HT** automatically detects a need for de-icing in two different ways.

### 3.4.1. DE-ICING MANAGEMENT BY TIME




The principle of de-icing management by time is simple. When the coil temperature (sensor located at the bottom of the outdoor exchanger) drops below a certain limit, a time lag starts counting down. When this counted down time reaches a set value (Default setting 50 minutes) the controller considers that there is a need for de-icing.

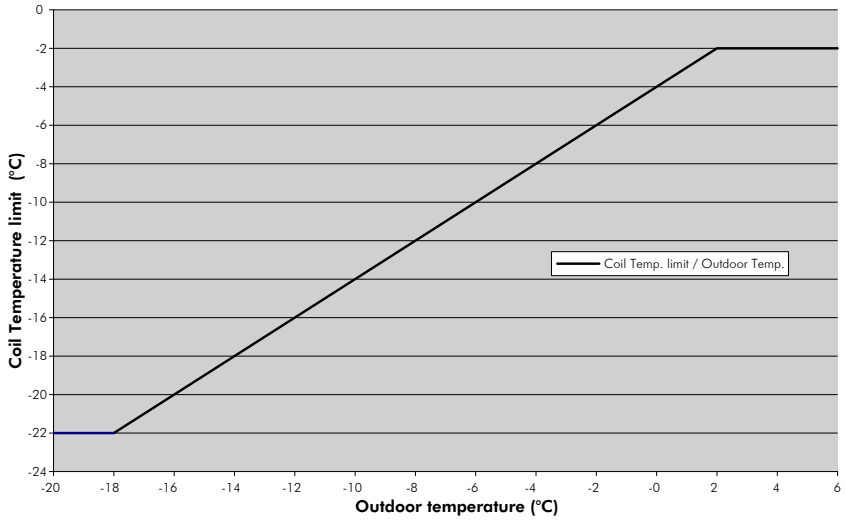
### 3.4.1.1. TEMPERATURE FOR THE START OF THE TIME COUNTDOWN

Screen M5 displays the parameters for the start of the time countdown before de-icing.

| DE-ICING PARAM. | M5 |
|---|---|
| Coil T.: | -03.8°C |
| Coil T. limit for countdown: | -02.0°C |

**Coil T.** is the instantaneous temperature read by the sensor located at the bottom of the outdoor exchanger (known as the evaporator).

**Coil T. limit for countdown** is the coil temperature limit for starting the countdown. When Coil T. drops below this value, the time countdown starts. The maximum value of this parameter is -2°C, but it changes automatically in relation to the outdoor temperature in the following manner:




### 3.4.1.2. TIME COUNTED DOWN BEFORE DE-ICING

When the coil temperature has remained below the **Coil T. limit for countdown** for a time **Coil T.<lim.** (50 minutes), de-icing starts.

Screen M6 enables the user to change the time before de-icing (Coil T.<lim.) and to view the time already counted down (**Time passed**, very useful when commissioning the **PAC HT** or during maintenance, as you always know how much time remains before the next de-icing).

| DE-ICING PARAM. Time (configurable) | M6 |
|---|---|
| Coil T.<lim: | 50min |
| Time passed: | 13min |

We do not recommend that the time before de-icing is changed without knowledge of the actual operating conditions of the **PAC HT**, and of heat pump systems in general. Increasing this time may lead to major de-icing malfunctions. Reducing it will lead to degraded product performance.

We also advise against reducing this time with the view to launching a de-icing sequence quickly. It is preferable to use the Manual De-icing function (Refer to the following §) that avoids altering the de-icing parameters.

The lapsed (or counted down) time only resets itself to zero in the case of de-icing, if the power to the **PAC HT** is switched off, or under very special conditions with the appliance stopped (Outdoor temperature > 7°C, coil temperature > 5°C and both compressors stopped for at least 30 minutes). If the compressors stop, this time is frozen and the countdown resumes when the compressors restart. If an alarm stops the de-icing, the time is not reset to zero and the **PAC HT** will attempt to proceed with a new de-icing sequence after the alarm has been reset.

(Refer to the § **EXAMPLE OF DE-ICING**, page 49)

### 3.4.1.3. POSSIBILITY OF DE-ICING WHEN THE COMPRESSORS STOP

When the compressors stop, either because the water or the room temperature setpoint has been reached, it is possible for the **PAC HT** to force a de-icing sequence.

When the compressors stop, if:

➢ Time counted down (**Time passed**) > time limit (**Coil T.<lim.**) – 5minutes (therefore default setting = 45 minutes),

it is considered more worthwhile to de-ice straightaway with the hot water in the Heating circuit, rather than launching a de-icing sequence just after compressor restarting.

There is an exception in relation to the stop by MAIN OFF (display) or remote OFF input. In this case, the **PAC HT** is immediately forced to stop and the de-icing sequence is not started.

### 3.4.2. ANTICIPATED DE-ICING

Under certain unfavourable outdoor conditions (e.g. freezing fog), it is possible that the **PAC HT** would need to start an anticipated de-icing sequence.

To start an anticipated de-icing sequence the following conditions are required:

➢ Entering water Temperature > 22°C,

➢ Outdoor Temperature < 10°C,

➢ Coil Temperature < -2°C,

| | |
|---|---|
| **ANTICIPAT. DE-ICE** | **M7** |
| **Coil/Out C1+C2:** | ***17.0°C*** |
| **Minimum delay:** | ***30min*** |
| **Max Coil/Outd:** | ***20.0°C*** |

➢ Time passed > 30 minutes (***Minimum delay***)
AND Two stage or large compressor alone operation
Outdoor Temperature – Coil Temperature > 17°C (***Coil/Out C1+C2***)
Small compressor operation on its own
Outdoor Temperature – Coil Temperature > 15°C (***Coil/Out C1+C2*** – 2°C).
This forces the compressors to have operated for a least 30 minutes before de-icing,

**OR** Outdoor Temperature – Coil Temperature > 20°C (***Max Coil/Outd***),
without a time delay as the difference is too high and therefore de-icing is instantaneous.

Therefore, the principle is to anticipate the de-icing sequence when the controller detects an abnormal difference between the Outdoor temperature and the Coil temperature, while respecting a compressor operating time of at least 30 minutes. If this difference is too high (e.g. case of restarting after a power cut, with a lot of ice on the coil), the anticipated de-icing sequence is started immediately without taking account of **Time passed**.

### 3.4.3. DE-ICING SEQUENCE

When all the de-icing conditions are present, the following sequence is activated:

- Compressors stop for 1 minute,
- De-icing valve changes over to "cold" position,
- Large C1 compressor starts,
- The compressor stops when coil temperature > 14°C during 10 consecutive seconds,
- De-icing valve changes over to "hot" position,
- Both fans operate for 30 seconds,
- The compressors restart after a stop of at least 1 minute.

The normal condition for an end to the de-icing sequence is the coil temperature above 14°C. However, other "abnormal" conditions may stop the de-icing cycle:

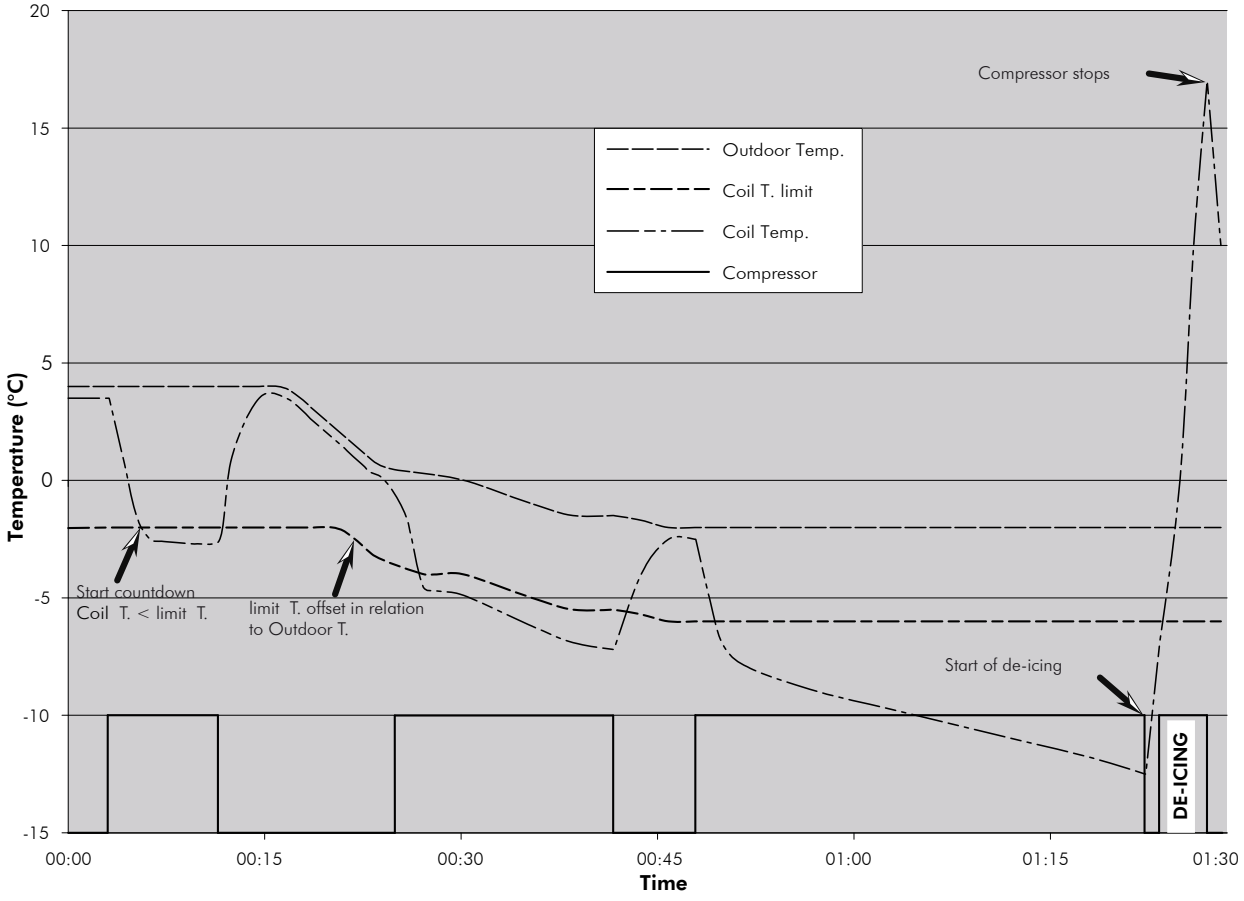
- De-icing time too long, longer than 10 minutes. The alarm AL 22 is for information purposes only and automatically disappears after 2 minutes.
- Leaving water temperature < 10°C, risk of the plate exchanger freezing. Just as the alarm AL 22, the alarm AL 23 will disappear automatically after 2 minutes.

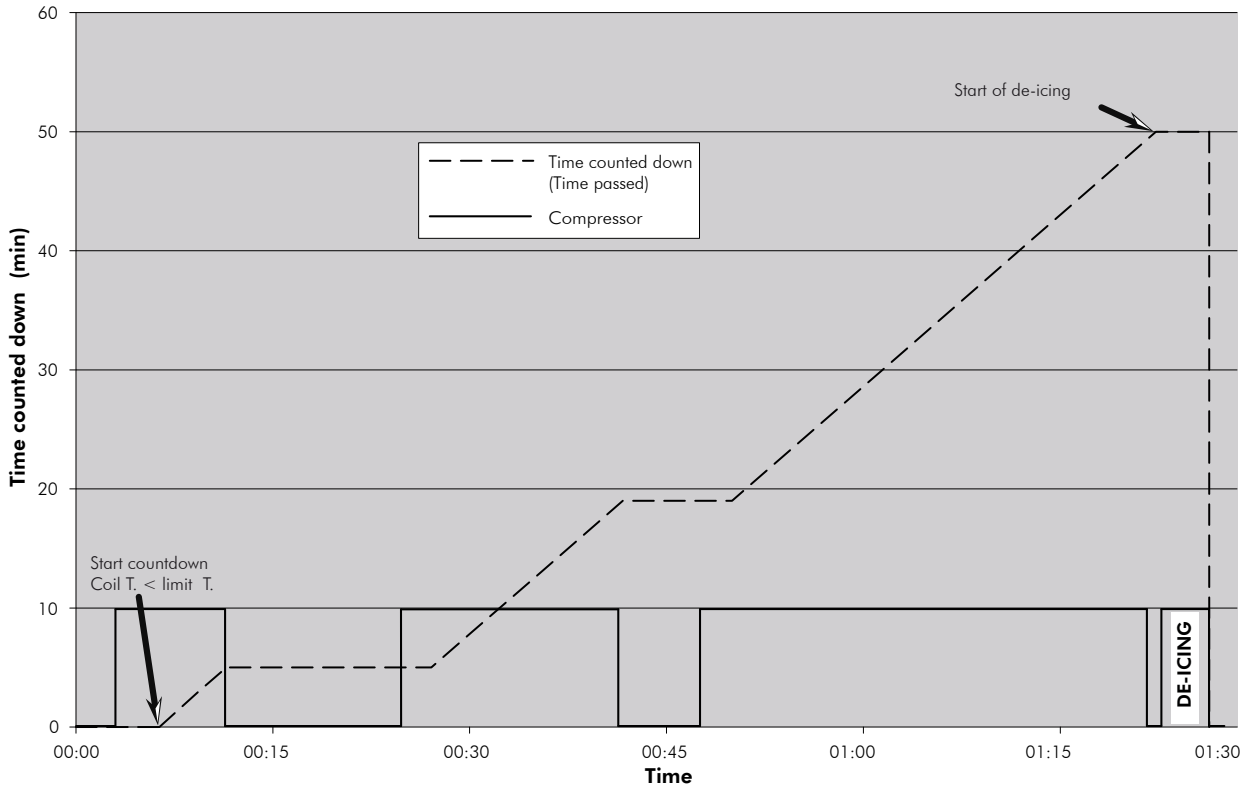
**Action should be taken if these two de-icing malfunctions occur repeatedly. Care must be taken to ensure that the PAC HT de-ices correctly (correct water flow, no obstruction of the airflow over the outdoor coil...).**

During de-icing, a pressostat manages the restarting of the upper fan in order to control the condensing pressure. When the latter is too high (around 24 bars), the fan starts until the pressure is lowered sufficiently. The fan then stops.

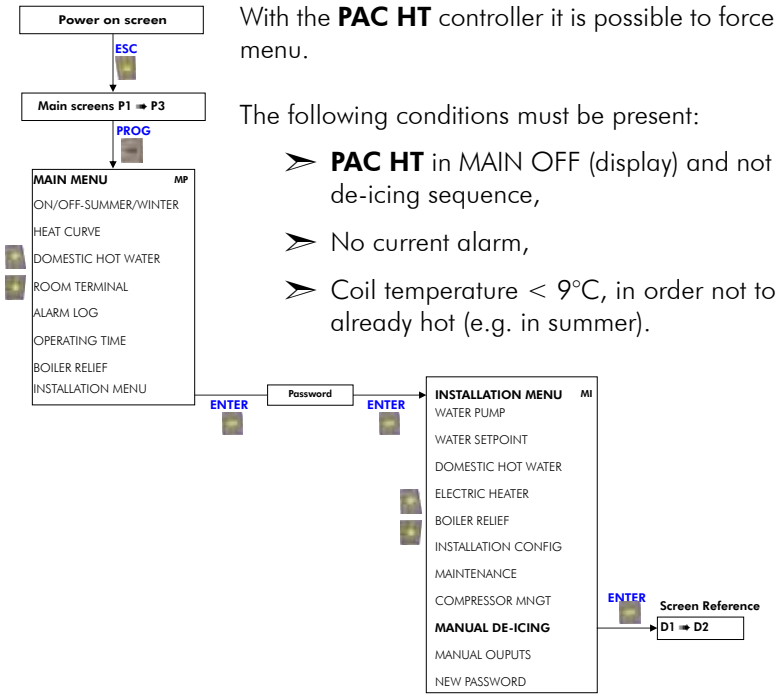
Apart from the coil temperature condition, excessively long de-icing or too cold leaving water, the alarms such as water flow interruption can also stop the de-icing sequence. However, if the **PAC HT** is already in a de-icing sequence, switching the system off via MAIN OFF will not stop it and the de-icing will continue right until the end of the cycle.

### 3.4.4. EXAMPLE OF DE-ICING



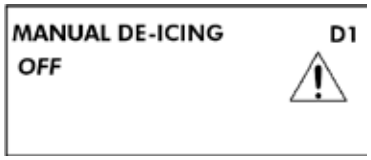
### 3.4.5. MANUAL DE-ICING

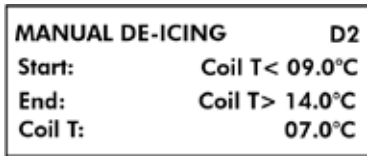



With the **PAC HT** controller it is possible to force de-icing manually via the Manual De-icing menu.

The following conditions must be present:

- **PAC HT** in MAIN OFF (display) and not switched ON before the end of the manual de-icing sequence,
- No current alarm,
- Coil temperature < 9°C, in order not to force a de-icing sequence when the coil is already hot (e.g. in summer).

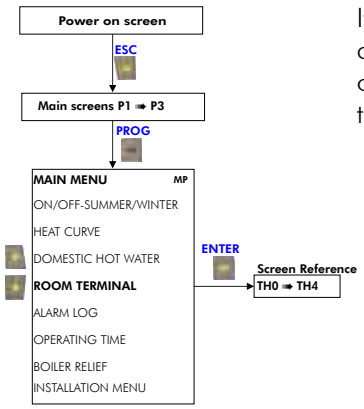



The condition required for de-icing to end is the same as usual, i.e. Coil Temperature > 14°C during 10 consecutive seconds.

We recommend the use of this function when you wish to check proper operation of the de-icing sequence. It is preferable to use this function as it does not require any changes to parameters, as opposed to the de-icing parameters in the Maintenance menu. Therefore, it avoids forgetting to restore the default parameters after de-icing and having to alter the sequence under normal operating conditions.

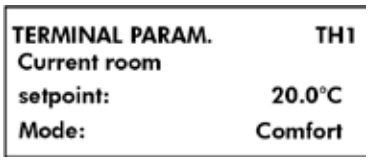
### 3.5. VIEWING ROOM TERMINAL PARAMETERS




It is vital to connect the room terminal to the **PAC HT** in order to optimise the heat curve and thereby achieve energy savings, while providing maximum comfort for occupants. It is possible to display on the screen of the **PAC HT** all the parameters that the room terminal sends to the controller via the communication bus.

### 3.5.1. SCREEN TH1

➢ **Current set room temperature setpoint**



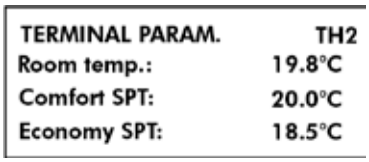

This is the current room temperature setpoint that changes in relation to the mode selected and the corresponding setpoint.

➢ **Mode**

This is the mode selected (Refer to the room terminal user manual). It can display the values:

- ✔ Comfort : "Forced" Comfort or Comfort in Automatic mode Auto.
- ✔ Economy (lower setpoint) : "Forced" Night Time Running or Night Time Running in Auto Auto.
- ✔ Vacation (Holidays) : Parameters for this mode set via on the room terminal. The **PAC HT** is then in Antifreeze Protection mode for a certain time period (parameter).
- ✔ Anti-freeze: . The **PAC HT** provides a minimum of Heating in this mode. (very low room setpoint).
- ✔ OFF : Standby mode . In this case, the **PAC HT** changes to Summer mode and the umbrella is displayed on screen P1. In this mode, the **PAC HT** no longer provides any Heating for the house, and simply provides the system safety functions (anti-freeze and water pump anti-seize protection…) and especially Domestic Hot Water.

### 3.5.2. SCREEN TH2

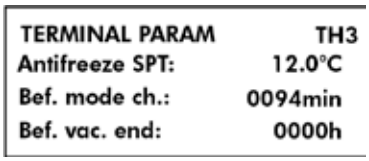



➢ **Room Temp.**
This is the room temperature displayed on the room terminal.

➢ **Comfort SPT**
Comfort setpoint. This one is used in "forced" Comfort mode and in Auto mode.

➢ **Economy SPT**
Economy setpoint. This one is used in "forced" Night Time mode and in Auto mode.

### 3.5.3. SCREEN TH3



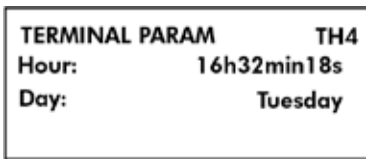

➢ **Anti-freeze SPT**
This is the Anti-freeze Protection setpoint .

➢ **Bef. mode ch.**
This is the time in minutes before a change of operating mode, i.e. the time remaining (in Automatic mode) before switching over from Comfort to Economy and vice-versa. In forced Comfort or Economy modes, this time is 1 440 minutes.

➢ **Bef. Vac. end**
This is the time in hours remaining before the end of the Vacation (Holidays) mode and the return to Automatic mode.

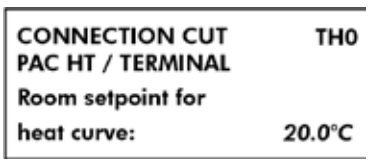
### 3.5.4. SCREEN TH4

Time and day of the week read on the room terminal.



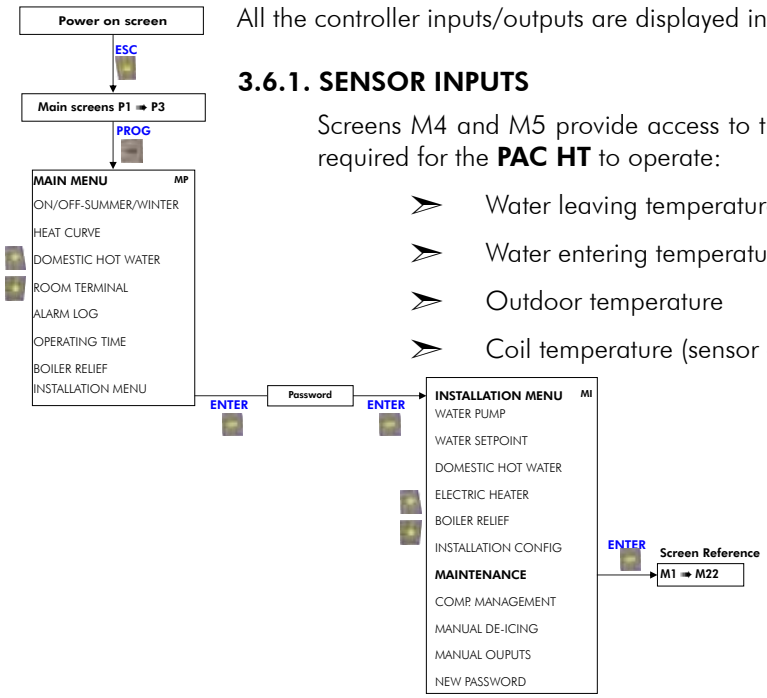

### 3.5.5. SCREEN TH0

Refer to the § **UNDECLARED ROOM TERMINAL**, page 14 in the chapter on **HEAT CURVE AND ROOM TEMPERATURE MANAGEMENT**.




This screen is displayed when the room terminal is deactivated in the Installation menu ➡ Installation Config or when there is a communication fault between the terminal and the **PAC HT**'s controller.

## 3.6. VIEWING INPUT/OUTPUTS




All the controller inputs/outputs are displayed in the Maintenance menu.

### 3.6.1. SENSOR INPUTS

Screens M4 and M5 provide access to the 4 temperature sensors (analogue inputs) required for the **PAC HT** to operate:

- Water leaving temperature
- Water entering temperature
- Outdoor temperature
- Coil temperature (sensor at the bottom of the outdoor coil)

### 3.6.2. DIGITAL INPUTS

Screens M8 to M12 display the status of all the digital inputs. This includes the fault inputs (fans, water flow…) and the inputs that can be connected at the time of installation (remote ON/OFF, Comfort/Eco for DHW and emergency Switch for the Electric Heater and the Boiler relief).

| DIGITAL INPUTS | M8 |
|---|---|
| Flowswitch: | Open |
| Fans: | Clos |
| Intermediate HP: | Clos |

- "**CLOS**" means Closed (power is supplied to the contact so no fault).
- "**OPEN**" means Open (power is not supplied to the contact, an alarm may appear).

### 3.6.3. DIGITAL OUTPUTS

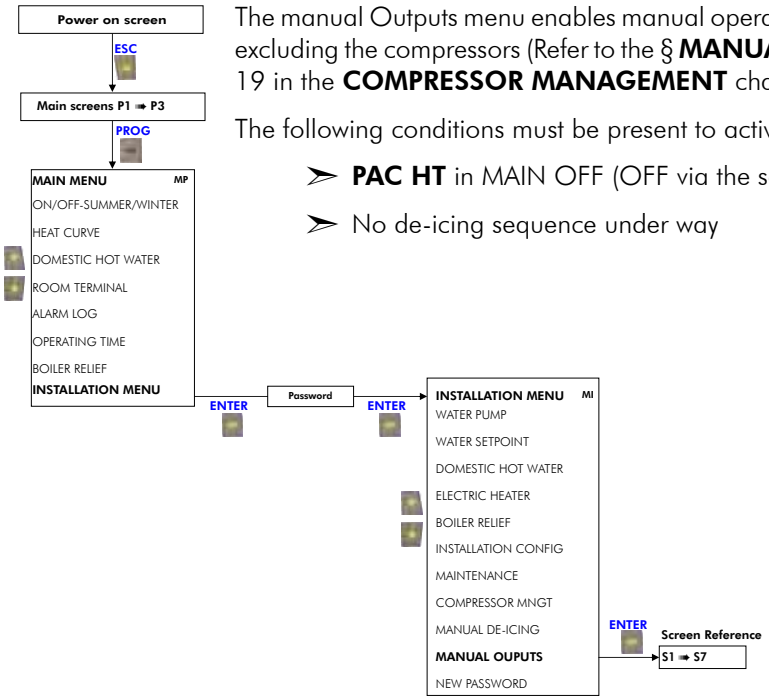
Screens M13 to M17 indicate the status of all the digital outputs, including those associated with options that can be activated (Domestic Hot Water, Electric Heater and Boiler Relief). Screen M16 only appears if the DHW is activated. Screen M17 corresponds to the Electric Heater and Boiler Relief.

| DIGITAL OUTPUTS | M13 |
|---|---|
| Comp.1 / Big: | OFF |
| Comp.2 / Small: | ON |
| Comp 4-w valve: | ON |

- "**OFF**" signifies that the output is inactive.
- "**ON**" signifies that the output is activated.

If there is any doubt over the active or inactive status of a **PAC HT** component, over the causes for the appearance of an alarm or a digital output associated with an option (e.g. DHW tank heater or boiler ON/OFF contact …), it is very worthwhile to observe the status of the inputs/outputs. The displayed information corresponds instantaneously to the status of what is active or not in the controller.

## 3.7. MANUAL OUPUTS




The manual Outputs menu enables manual operation of all the digital outputs on the **PAC HT**, excluding the compressors (Refer to the § **MANUAL COMPRESSOR MANAGEMENT**, page 19 in the **COMPRESSOR MANAGEMENT** chapter).

The following conditions must be present to activate the manual Outputs function:

- **PAC HT** in MAIN OFF (OFF via the screen O0)
- No de-icing sequence under way

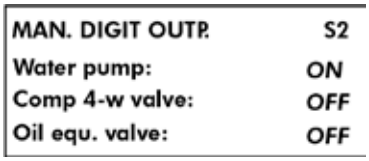
### 3.7.1. MANUAL OUTPUT FUNCTION ACTIVATION

Before being able to activate separately each digital output, you have to activate the global function via the S1 screen. This operation will give access to the following screens.

### 3.7.2. WATER PUMP

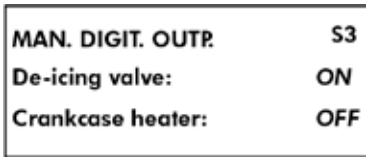
The pump can be activated via the screen S2.

When it is activated manually, the water flow safety system is deactivated.




### 3.7.3. VALVES

Screens S2 and S3 provide access to the outputs for the valves, the compressor four-way valve, and the oil equalisation valve on screen S2, and the de-icing valve on S3.




### 3.7.4. COMPRESSOR CRANKCASE HEATERS

The compressor crankcase heaters can be activated via the screen S3. Both heaters are driven by a single digital output.

### 3.7.5. FANS

The two fans can be activated separately via the screen S4.

When the fan fault input is open, it is impossible to activate them manually. "Al." for Alarm then appears in the place of OFF.

| MAN. DIGIT. OUTP. | S4 |
|---|---|
| Upper fan: | ON |
| Lower fan: | OFF |

### 3.7.6. DOMESTIC HOT WATER (DHW)

Screen S5 dedicated to DHW is only available if this function has been activated via the screen IE1.

The ***DHW Valve*** output enables the switching test of the DHW valve.

The ***DHW Elec. heater*** drives the DHW tank back-up electric heater. If it is forgotten, the heater is automatically deactivated after 10 minutes.

| MAN. DIGIT. OUTP. | S5 |
|---|---|
| DHW valve: | ON |
| DHW Elec. heater: | OFF |

### 3.7.7. ELECTRIC HEATER

Screen S6 dedicated to the electric heater is only available if this function has been activated via the screen EH1.

In the same way as the DHW resistance, the two stages of the electrical heater are cut off automatically after 10 minutes.

| MAN. DIGIT. OUTP. | S6 |
|---|---|
| Electric heater | |
| Stage 1: | OFF |
| Stage 2: | ON |

It is possible to activate the two stages of the electric heater separately, but only if the water pump has been operating for at least 40 seconds beforehand, without any interruption in the water flow. If this is not the case, the electric stages are inaccessible.

| MAN. DIGIT. OUTP. | S6 |
|---|---|
| Electric heater | |
| Pump OFF (ON 40s) | |
| or lack of water fl. | |

### 3.7.8. BOILER RELIEF

Screen S7 dedicated to Boiler Relief appears when this function has been activated via the screen IR1.

The ***Boiler*** output activates the boiler operation contact.

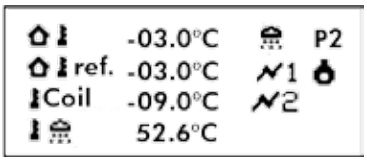
The ***Boiler Valve*** output switches the boiler valve.

| MAN. DIGIT. OUTP. | S7 |
|---|---|
| Boiler: | OFF |
| Boiler valve: | ON |
| Info: Water pump | OFF |

The message "Info: Water pump OFF" is a warning when the **PAC HT** pump has not been activated manually. Therefore, it is preferable to start the pump manually beforehand when starting the boiler.

### 3.8. OUTDOOR TEMPERATURE / REMOTE SENSOR MANAGEMENT

As a default setting, the **PAC HT** manages the upper fan in order to always have a valid reference outdoor ref., visible on screen P2. This reference temperature is very important insofar as it used to calculate the heat curve and the choice of compressor(s), as well as to determine their operating limits in Heating and DHW modes.




When the controller considers that the reference ref. is no longer up to date and that it is necessary to take a new value, the upper fan operates for 90 seconds before replacing ref. by the instantaneous outdoor temperature value . For this reason, there may be a difference between the reference and the instantaneous values.

The reference value is also updated when at least one of the compressors operates for longer than 90 second with the fans running.

#### 3.8.1. ROOM HEATING MODE

In the case where there is a demand for Heating from the room temperature and if the **PAC HT** is stopped due to water temperature (display message: "Waiting Water T"), the controller will take an outdoor temperature reference every 30 minutes. If one of the compressors restarts before the end of this time, the reference temperature will only be updated after the compressor has been operating for 90 seconds. This means that in normal operating mode in winter, there is no special management of the upper fan.

#### 3.8.2. DHW MODE

When there is a demand for DHW production (Refer to the § **DOMESTIC HOT WATER**, page 21), the **PAC HT** always ensures that it has an updated reference outdoor temperature in order not to change into DHW mode if the compressors are unable to start (in the event of the DHW being too hot in the tank). However, the time lapse between two reference temperatures readings for DHW is 60 minutes (versus 30 minutes in Heating mode).

Under normal DHW operating conditions, i.e. when the setpoint is compatible with compressor operation, the reference temperature will only be taken rarely and DHW production will start thereafter.

If the reference temperature is taken every hour and the **PAC HT** does not change over to DHW production, it means that the setpoint has been set too high to operate the compressors. If the tank is equipped with an electric heater, then this will start instead of the compressors and lead to excessive electricity consumption.

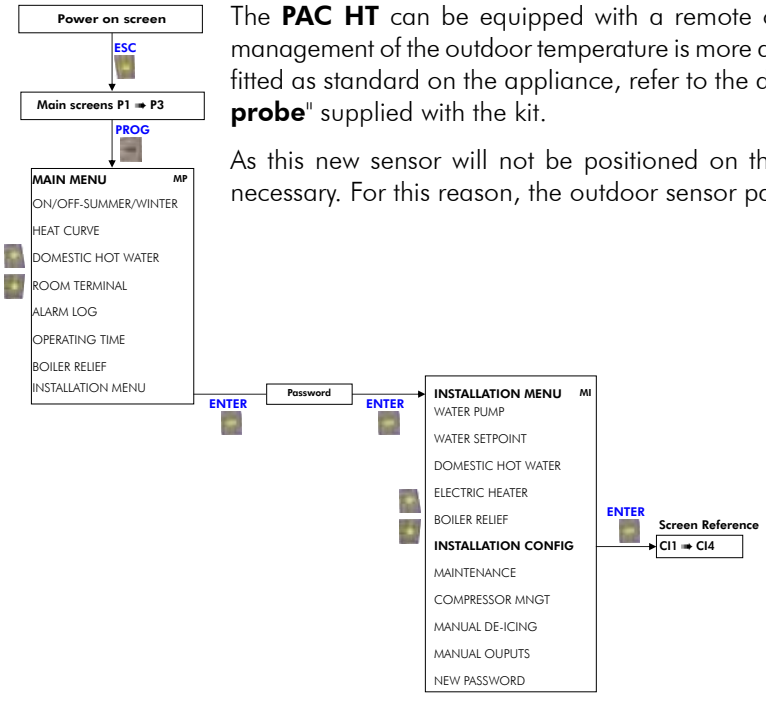
#### 3.8.3. NO NEED FROM ROOM TEMPERATURE OR IN SUMMER MODE

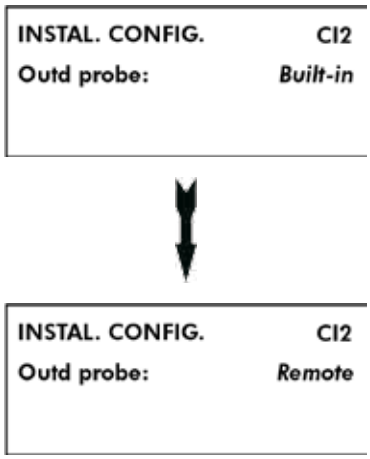
When no situation requires the compressors to start (no need from room temperature or in Summer mode, no demand for DHW production), the reference outdoor temperature is no longer updated and this avoids unnecessary fan operation.

#### 3.8.4. DE-ICING

During de-icing, the reference outdoor temperature is frozen during 5 minutes after the de-icing sequence has ended. In this way the reference temperature is not influenced at all by a sharp change in outdoor temperature at the level of the sensor.

### 3.8.5. REMOTE OUTDOOR SENSOR



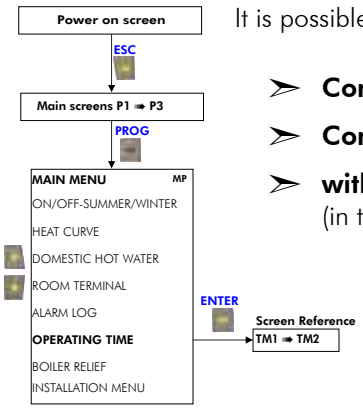

The **PAC HT** can be equipped with a remote outdoor sensor option, although automatic management of the outdoor temperature is more accurate. To wire this sensor to replace the one fitted as standard on the appliance, refer to the documentation "**Outdoor air temperature probe**" supplied with the kit.

As this new sensor will not be positioned on the **PAC HT**, fan management is no longer necessary. For this reason, the outdoor sensor parameter should be set to ***Remote***.

**Never declare the presence of a *Remote* outdoor temperature snsor if it is not actually installed.**

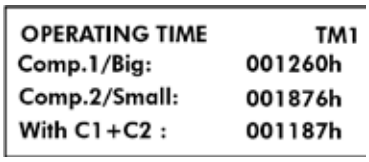
## 3.9. OPERATING TIME, NUMBER OF STARTS

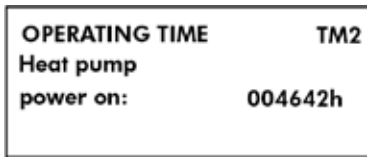
### 3.9.1. OPERATING TIME




It is possible to view the compressors' operating times on screen TM1.

- **Comp.1/Big** is the operating time of the C1 compressor.
- **Comp.2/Small** is the operating time of the C2 compressor.
- **with C1+C2** that represents the operating time of both compressors simultaneously (in two stage mode). This time forms part of the two other times above.



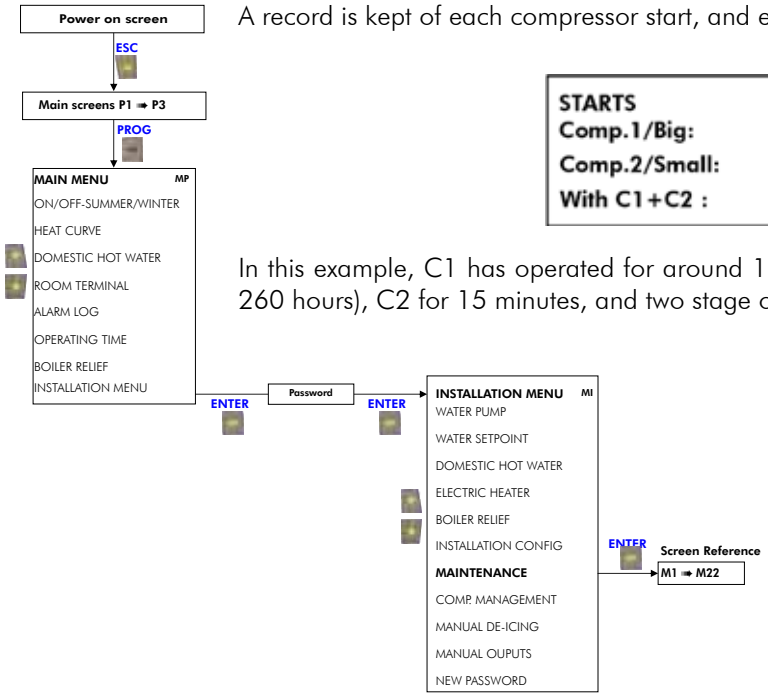




In this example, C1 has operated for **1260h** of which **1187h** were in two stage mode (therefore 83h on its own). C2 has operated for **1876h**, therefore 689h on its own (1876-1187).

Screen TM2 provides access to the number of hours during which the mains power to the PAC HT has been switched on.

During maintenance at each season change, it is worthwhile noting the compressors' operating times and calculating the total number of operating hours during the heating season. If the number of operating hours is too high, it could mean that the **PAC HT** is under-sized for the installation.

### 3.9.2. NUMBER OF STARTS




A record is kept of each compressor start, and every start in two stage mode.

| STARTS | M2 |
|---|---|
| Comp.1/Big: | 004123 |
| Comp.2/Small: | 007206 |
| With C1+C2 : | 003739 |

In this example, C1 has operated for around 18 minutes on average (**4123** start-ups in 1 260 hours), C2 for 15 minutes, and two stage operation has lasted 19 minutes.

The number of compressor starts is to be compared against their number of operating hours. This enables any short-cycling problems to be identified on the installation (e.g. in the event of insufficient water volume).

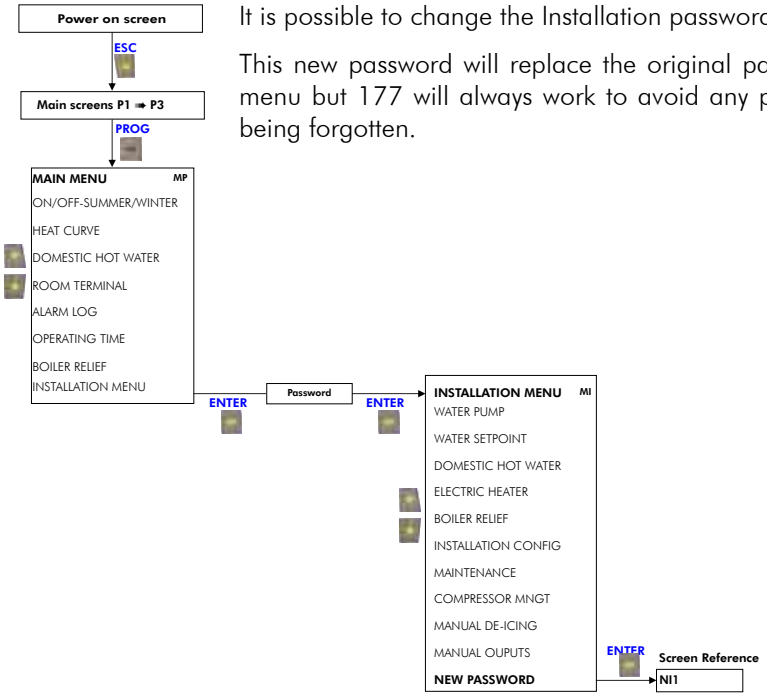
### 3.10. COMPRESSOR CRANKCASE HEATER MANAGEMENT

On the **PAC HT**, the compressor crankcase heaters are managed by the controller according to the following rules:

- ➢ One of the two compressors stopped for longer than 10 consecutive minutes
- ➢ Outdoor Temperature < 5°C

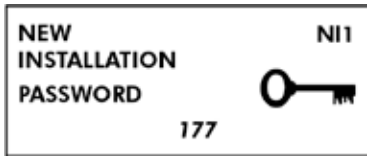
When these conditions are present, power is supplied to the two heaters simultaneously (both heaters are powered via the same digital output). Power to the heaters is switched off when one or both of the stopped compressors restart(s) or when the outdoor temperature is greater than 7°C.

## 3.11. NEW INSTALLATION PASSWORD




It is possible to change the Installation password via the screen NI1.

This new password will replace the original password (177) for entry into the Installation menu but 177 will always work to avoid any problems in the event of the new password being forgotten.



When the **PAC HT** is being commissioned, changing the new password to 0 saves a lot of time during installation setting, when viewing the inputs/outputs and when activating the manual outputs.

## 4. ALARM LIST AVAILABLE ON THE PAC HT DISPLAY

Software version: 5.1

Some terms may differ depending on the software version.

| Ref. | Alarm description | PAC HT action | Alarm cancellation | Time delay | Possible cause(s) | Recommended action(s) |
|---|---|---|---|---|---|---|
| AL01 | Inlet (return) water probe disconnected or damaged | Complete shutdown | Manual | 10 s | Disconnected or faulty probe | Replace the probe |
| AL02 | Outlet water probe disconnected or damaged | Complete shutdown | Manual | 10 s | | |
| AL03 | Outdoor temperature probe disconnected or damaged | Complete shutdown | Manual | 10 s | | |
| AL04 | Domestic hot water probe disconnected or damaged | DHW shutdown | Manual | 10 s | | |
| AL05 | Outdoor coil probe disconnected or damaged | Complete shutdown | Manual | 10 s | | |
| AL06 | Lack of water flow, risk of freezing | Complete shutdown and forced pump shut down | Manual | 30s after start of circulation pump | Sticking circulation pump | Check circulation pump operation (stop it from sticking) |
| | | | | | Water flow too low or air in the system | Check the PAC's temperature difference in operation. Increase the flow (change the circulation pump speed) |
| AL07 | Not allocated | | | | | |
| AL08 | Fan fault | Complete shutdown | Manual | None | Internal overheating protection tripping out on one of the fans | Reset the alarm after the fan motors have cooled down. Check which fan is overheating and replace it |
| AL09 | C1 – Large compressor overcurrent | Automatic changeover to C2 compressor<br>WARNING: De-icing impossible. | Manual (**PAC HT** OFF via keypad) | None | Fuse(s) blown (single phase) | Test the fuses. Replace as required |
| | | | | | Thermo-magnetic circuit breaker tripped (three phase) | Reset the circuit breaker. Check that the setting corresponds to specifications |
| AL10 | C2 – Small compressor overcurrent | Automatic changeover to C1 compressor | Manual (**PAC HT** OFF via keypad) | None | Fuse(s) blown (single phase) | Test the fuses. Replace as required |
| | | | | | Thermo-magnetic circuit breaker tripped (three phase) | Reset the circuit breaker. Check that the setting corresponds to specifications |
| AL11 | High Pressure safety tripped | Complete shutdown (no automatic reset) | Manual (**PAC HT** OFF via keypad) after at least 2 minutes stoppage | None | Refer to the fault diagnosis guide in the Installation and Maintenance Manual | Refer to the fault diagnosis guide in the Installation and Maintenance Manual |
| | | | | | Water flow too low or air in the system | Re-establish nominal water flow or bleed the system |

| Ref. | Alarm description | PAC HT action | Alarm cancellation | Time delay | Possible cause(s) | Recommended action(s) |
|---|---|---|---|---|---|---|
| AL12 | Low Pressure safety trips | Complete shutdown (no automatic reset) | Manual (**PAC HT** OFF via keypad) after at least 2 minutes stoppage | 60 s after compressor start-up | Refer to the fault diagnosis guide in the Installation and Maintenance Manual | Refer to the fault diagnosis guide in the Installation and Maintenance Manual |
| | | | | | Coil blocked | Clean the finned coil |
| | | | | | Incomplete de-icing (lack of refrigerant charge) | Check the amount of refrigerant charge |
| AL13 | Not allocated | | | | | |
| AL14 | Safety protection trips on both compressors, appliance shut down | Complete shutdown | Manual (**PAC HT** OFF via keypad) | None | Both compressors in Alarm mode | Find the cause of the alarm for each compressor |
| AL15 | B PAC/Terminal cable breakage, Forced heating | Switchover to forced heating mode via a pre-set ambient temperature (20° C by default) | Manual | 20s | Only the wire on terminal B is disconnected or faulty. Any other communication fault will be flagged up by Alarm 16. | Check the connections on the **PAC HT** and the terminal. Check the continuity of the B polarity wire. |
| AL16 | PAC/Terminal communication failure, forced Heating | Switchover to forced Heating mode by changing the adjustable ambient temperature (Default setting: 20° C) | Manual | Variable depending on the cause of the problem (clean trip or trip due to electrical interference) | Ambiance terminal is not connected | Deactivate it via the **PAC HT** keypad |
| | | | | | One of the communication cables is disconnected | Check the connections on the **PAC HT** and the terminal as well as the polarities (A and B) |
| | | | | | Too much interference on the communication bus | Use shielded cable as recommended |
| AL17 | Phase inversion or phase missing | Complete shutdown | Manual | None | Power supply fault detection by the phase controller (three phase) | Two phases have been inverted or one phase is missing. Refer to the Installation and Maintenance Manual |
| AL18 | Need to de-ice, C1 (large) compressor unavailable | Complete shutdown | Auto. If outdoor conditions permit natural de-icing | None | There is a fault on the large C1 compressor at a time when it is required by the **PAC HT** for de-icing | Rectify the fault on the C1 compressor |
| AL19 to 21 | Not allocated | | | | | |

| Ref. | Alarm description | PAC HT action | Alarm cancellation | Time delay | Possible cause(s) | Recommended action(s) |
|---|---|---|---|---|---|---|
| AL22 | De-icing ended abnormally by maximum time limit. | De-icing stopped | Auto. Alarm displayed for 2 minutes for information purposes | None | De-icing has lasted over 10 minutes. This is abnormal as de-icing usually takes between 3 and 4 minutes | Monitor the appliance to see if this fault is a one-off occurrence, If not, check all possible causes of poor de-icing (lack of refrigerant charge) |
| AL23 | De-icing ended abnormally by low outlet water temperature | De-icing stopped | Auto. Alarm displayed for 2 minutes for information purposes | None | Outlet water temperature during de-icing has fallen below 10° C | Check that there is sufficient water volume in the system, as recommended in the Installation and Maintenance Manual |
| AL24 | C1 Large compressor discharge temperature thermostat | Complete shutdown | Manual | None | Tripped out by the C1 compressor discharge temperature thermostat | Monitor the appliance to see if this fault is a one-off occurrence, if not check the level of the charge in the expansion tank or for compressor overheating (perhaps too hot due to an output blockage) |
| AL25 | C2 Small compressor discharge temperature thermostat | Complete shutdown | Manual | None | Tripped out by the C2 compressor discharge temperature thermostat | |
| AL26 | Not allocated | | | | | |
| AL27 | De-icing valve failure | Complete shutdown | Manual (**PAC HT** OFF via keypad) | 90 s | De-icing valve fault detected automatically by the control system. Valve disconnected, inverted or blocked | Check valve wiring. Activate the Manual controller outputs and check that the valve operates. Replace the valve if the slide is blocked or the coil is burnt out |
| AL28 | C1 Large compressor switched to safety mode by system | Automatic changeover to C2 compressor<br>WARNING: De-icing impossible. | Manual (**PAC HT** OFF via keypad) | 90 s | Fault detected automatically by the system management (e.g. when the Temp. difference is too low, indicating that the compressor has not started) | Refer to fault diagnosis guide in the Installation and Maintenance Manual<br>Probable cause: single phase soft starter defective or supply voltage too low |
| AL29 | C2 Small compressor switched to safety mode by system | Automatic changeover to C1 compressor | Manual (**PAC HT** OFF via keypad) | 90 s | | |
| AL30 | De-icing problem – C1 compressor or comp. valve | Automatic changeover to C2 compressor | Manual (**PAC HT** OFF via keypad) | 90 s | Zero temperature difference during de-icing due to C1 compressor not starting or non activation of the compressor changeover valve. Impossible to determine the cause of the blockage in compressor C1 with certainty | Check that C1 is operating correctly.<br>Check the compressor changeover valve wiring. Activate the Manual controller outputs and check that the valve operates. Replace the valve if the slide is blocked or the coil is burnt out |
| AL31 | Defective compressor changeover valve | Automatic changeover to C2 compressor | Manual (**PAC HT** OFF via keypad) | 10 s | Alarm generated by the intermediate pressostat. Compressor changeover valve disconnected, blocked or coil burnt out | Check the compressor changeover valve wiring. Activate the Manual controller outputs and check that the valve operates. Replace the valve if the slide is blocked or the coil is burnt out |

| Ref. | Alarm description | PAC HT action | Alarm cancellation | Time delay | Possible cause(s) | Recommended action(s) |
|---|---|---|---|---|---|---|
| AL32 | Inlet /outlet water probes inverted | Complete shutdown | Manual (**PAC HT** OFF via keypad) | 90 s | Automatic detection by management system if the water temperature probes are inverted | Invert the probes at the level of the controller. Check the probe values during operation of both compressors |
| AL33 | Temperature difference > 20°C, flow too low, clean filter | Complete shutdown | Manual (**PAC HT** OFF via keypad) | 90 s | Insufficient water flow in the circuit, flow too low for proper **PAC HT** operation | Check that the water flow in the system is always adequate (presence of thermostatic radiator valves)<br>Clean the inlet water filter on the **PAC HT** |
| AL34 | N°1/Large compressor in safety mode via auto restart control | Complete shutdown during 7 minutes. 2 cut-outs ➠ AL28 | Automatic | 90 s | Fault detected automatically by the system management (e.g. when the Temp. difference is too low, indicating that the compressor has not started) | Refer to fault diagnosis guide in the Installation and Maintenance Manual<br>Probable cause: single phase soft starter defective or supply voltage too low |
| AL35 | N°2/Small compressor in safety mode via auto restart control | Complete shutdown during 7 minutes. 2 cut-outs ➠ AL29 | Automatic | 90 s | | |
| AL36 | --Information-- Boiler/ Electric heat. backup activated | Information | Stop backup mode | None | Activation of the ICS digital input of the controller or backup mode through the display for boiler relief | |



**General comments:**

If you have a doubt about a **PAC HT** component, use the Manual activation function for the outputs (all the all or nothing outputs excluding the compressors) via the "INSTALLATION" menu on the appliances display. Use a voltmeter to check that the regulator output is activated (230V) and that the component is question in also activated.

The **PAC HT** retains a very comprehensive log of alarms, i.e. the 150 last alarms, as well as temperature probe values (water inlet and outlet, outdoor and outdoor battery) when the alarm appears. You can access this log from the main menu (sub-menu "Alarm log").

Press the ENTER ( ) key to switch back and forth between the log screen and the probes screen.

Generally, an alarm means that there is an anomaly with the appliance. We strongly **advise against** repeatedly resetting an alarm at the risk of causing **irreparable damage** to one or several components.

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| ON/OFF - SUMMER/ WINTER | ON/OFF SUMMER/ WINTER | O0 (O zero) | Mode | WINTER (Heat. On) / SUMMER (Heat. Off) | | WINTER (Heat. On) | | 2.3.2 | Choice of Winter (Heating ON) or Summer (Heating off) modes. |
| | | | On/Off | GENERAL OFF / ON | | GENERAL OFF | | 2.3.1 | **PAC HT** ON / OFF. GENERAL OFF means that only appliance's protection systems are operating, but there is no heating or DHW. |
| WATER LAW | Heating curve | L1 | Altitude | km | 0.0 | 0.0 | 4.0 | 2.4.2 | Altitude of the **PAC HT** installation site. Not applicable below a height of 500m. |
| | | | Base Temp. | °C | -20 | -7 | 7 | | Base outdoor temperature of the installation site. |
| | | | Corr Coef. | - | 0.5 | 0.8 | 1 | | Correction coefficient for the foot of the water law slope. |
| | | L2 | Heat loses at base Temp. | kW | 0.0 | Max. | Max. | | Residence heat losses at base outdoor temperature. The default value, as is the maximum value, is automatically calculated in relation to the **PAC HT** model and the base outdoor temperature. |
| | | | Base outlet T. | °C | 20 | 65 / 35 | 90 / 50 | | Desired water outlet temperature towards the emitters at the base outdoor temperature. In Radiators configuration default is 65° C and Max. 90°C. In Under-floor heating configuration, default is 35°C and Max. 50°C. |
| | Balance outdoor temperature | L3 | Default setting: Comp.2 (small) | °C | | | | 2.6.2 | Outdoor temperature, calculated from the heating curve parameters, above which the C2 small compressor's capacity is actually sufficient to heat the residence. |
| | | L4 | Automatic Comp.2(small) | °C | | | | | Balance temperature updated automatically, above which the C2 small compressor's capacity is actually sufficient to heat the residence. |
| | | | Reset to zero | Yes / No | | No | | | Resets to the default value setting of the automatic balance temperature. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| DOMESTIC HOT WATER | Unavailable | ES0 | | | | | | 2.7 | Screen displays when the DHW is not declared in the Installation menu or when the DHW probe is not detected. |
| | Set temperature / Current mode | ES1 | Current set T. | °C | | | | 2.7.3 | Current set DHW temperature selected depending on the current mode. |
| | | | Current Mode | Eco / Comf. | | | | | Current mode, dependant on the timer settings or the dedicated off-peak hours input. |
| | Set temperature / Mode selection | ES2 | Mode | Continuous Comf. / Comf./Eco. | | Comf./Eco. | | | Choice of DHW operating mode: Continuous Comfort (based only on the set Comfort temperature) or Comfort/ Eco (which will automatically change from Comfort to Eco in relation to the timer settings or the off-peak hours input). |
| | | | Set Comfort T. | °C | 10 | 50 | 80 | | Set Comfort temperature, at 50°C, so that DHW can always be produced by the compressors on their own (without back-up electrical heating). <53°C RECOMMENDED. |
| | | | Set Eco. Temp.. | °C | 10 | 45 | 80 | | Set Economy temperature, lower than the set Comfort temperature. Is only displayed if the Comf./Eco. mode is selected. |
| | Quick Hot Water | ES3 | Quick Hot Water | Yes / No | | No | | 2.7.4 | Activation of the DHW tank quick hot water function. Is automatically deactivated. |
| | Hourly and Daily timer programming – Monday to Sunday | ES4/ ES10 | 1.ON | - | 0:00 | 0:00 | 23:50 | 2.7.3 | Start time of the Comfort mode in the 1st time period. |
| | | | OFF | - | 0:00 | 05:00 | 24:00 | | End (or Stop) time of the comfort mode in the 1st time period. |
| | | | 2.ON | - | 0:00 | 23:00 | 23:50 | | Start time of the Comfort mode in the 2nd time period. |
| | | | OFF | - | 0:00 | 24:00 | 24:00 | | End (or Stop) time of the comfort mode in the 2nd time period. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| AMBIENCE TERMINAL | PAC/Terminal link cut | TH0 | Set Ambient temperature for the water law | °C | 12.0 | 20.0 | 30.0 | 2.4.3 | "Manual" set ambience temperature in the case of no communication with the ambiance terminal (terminal undeclared in the Installation menu or regulator/terminal communication fault). |
| | Ambience terminal parameters | TH1 | Current set ambient temperature | °C | | | | 2.4.3 | Display of the current set ambient temperature. |
| | | | Mode | - | | | | 3.5.1 | Display of the current mode selected on the ambience terminal. |
| | | TH2 | Ambient Temp. | °C | | | | | Ambient temperature read by the terminal. |
| | | | Set Comfort T. | °C | | | | | Display of the parameter of the set Comfort temperature. |
| | | | Set Night Time Slow Running T. | °C | | | | | Display of the parameter of the set Night Time Slow Running temperature. |
| | | TH3 | Set Anti-freeze T. | °C | | | | | Display of the parameter of the set Anti-freeze protection temperature. |
| | | | Before mode change | min | | | | | Time remaining until Comfort ⇆ Night Time Slow Running changeover. |
| | | | Before end Vac. | h | | | | | Time remaining until the end of the Vacation (holidays) period. |
| | | TH4 | Time | - | | | | | Time set on the ambience terminal. |
| | | | Day | - | | | | | Day of the week set on the ambience terminal. |
| ALARMS LOG | Alarms Log | H1 | | | | | | 3.3 | Display of alarm code and its order and time of appearance (if the ambience terminal is connected), time elapsed since the last alarm and its description. |
| | | H2 | | | | | | | Display of probe values at the time of appearance of the alarm. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| OPERATING TIME | Compressors | TM1 | Comp.1/ Large | h | | | | 3.9.1 | Number of operating hours of the C1 compressor (on its own and in two stage mode). |
| | | | Comp.2/Small | h | | | | | Number of operating hours of the C2 compressor (on its own and in two stage mode). |
| | | | Inc. C1+C2 | h | | | | | Total number of operating hours of the compressors in two stage mode. |
| | PAC HT | TM2 | Power ON | h | | | | | Total number of hours during which the power to the **PAC HT** has been switched on. |
| BOILER SUB-STITUTION | Unavailable | R0 | | | | | | 2.9 | Screen displayed when the Boiler Substitution function is not activated in IR1. |
| | Emergency mode | R1 | Emergency mode | Yes / No | | No | | 2.9.2 | Manual activation of the Boiler Substitution Emergency mode. |
| CIRCULATION PUMP | Circulation pump management | Ci1 | By the PAC | By the PAC / External | | By the PAC | | 3.1 | Circulation pump management by the **PAC HT** or external to the appliance. |
| | | | ON in Winter | - | Always ON | ON in Winter | ON on demand | 3.1.2 | Circulation pump ON/OFF management (when managed by the PAC): Always ON (even when the **PAC HT** is in GENERAL OFF), ON in Winter mode (stopped in Summer) or ON in demand (stopped when that is no demand in ambience mode, even in Winter). |
| | Operating time | Ci2 | Pre-circulation time | s | 30 | 120 | 600 | | Minimum circulation pump operating time before compressors start. |
| | | | Post-circulation time | s | 0 | 300 | 900 | | When it is authorised to stop, circulation pump running time after the compressors stop. |
| | Anti-freeze | Ci3 | Min. water T. | °C | -10.0 | 6.0 | 15.0 | 3.2 | Water temperature relative to Anti-freeze protection. |
| | | | Differential | °C | 4.0 | 5.0 | 9.9 | | Temperature differential for Anti-freeze protection to stop. |
| | Anti-freeze - Warning | Ci4 | Min. water T. | °C | -10.0 | 6.0 | 15.0 | 3.2.3 | Warning screen displayed when Min Water T. < 3°C. Demand for glycol in the **PAC HT**'s hydraulic circuit to avoid any risk of freezing. |
| | Anti-seize | Ci5 | Stoppage time | h | 3 | 23 | 27 | 3.1.2 | Circulation pump stoppage time before anti-seize procedure. |
| | | | Operating time | s | 10 | 120 | 300 | | Circulation pump operating time during anti-seize procedure. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| SET WATER TEMP-ERATURE | Set outlet water temperature – Radiators / under-floor heating | CE1 | Auto / Manual | Auto. (RECOM-MENDED) / Manual | | Auto. (RECOM-MENDED) | | 2.4.4 | Automatic or Manual Management of the set outlet water temperature, in Radiators or Under-floor Heating configuration (Refer to Installation Config screen CI1). |
| | | | Manual set Temp. | °C | 20 | 45 | 65 | | Manual set outlet water temperature. Display only in manual set outlet water temperature mode. |
| | Ambience management | CE2 | Water law offset by set ambience T. | °C | 0 | 5 / 2 | 9 | 2.4.3 | Set outlet water temperature offset by the ambience °C, to be made up. Default setting: 5°C in Radiators configuration, 2°C on Under-floor Heating configuration. |
| | Maximum outlet water T. | CE3 | Maximum | °C | -- / 30 | -- / 45 | -- / 50 | 2.5.2 | Limitation of outlet water temperature. No maximum value in Radiators configuration, Default setting at 45°C, limited to 50°C, in Under-floor Heating configuration. |
| DOMESTIC HOT WATER | Activation | IE1 | DHW activated | Yes / No | | No | | 2.7.1 | DHW function activation. Beforehand, the DHW probe must be connected to the regulator. |
| | ECO mode selection | IE2 | Off-peak hours | Timer prog. / Off-peak hours-ID11 | | Off-peak hours-ID11 | | 2.7.3 | Choice of type of Eco mode selection. By default, this is the off-peak hours input to be wired to the **PAC HT**. timer programming (accessible in ES4) requires an ambience terminal to be connected. |
| | | | NO | NO: Closed=DHW / NC: Open=DHW | | NO: Closed =DHW | | | Only displayed for the off-peak hours input. Choice of type of input switching, NO: Normally Open or NC = Normally Closed. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| DOMESTIC HOT WATER | Legionnaires' Disease Protection | IE3 | Activated | Yes/No | | Yes | | 2.7.7 | Legionnaires' Disease Protection function activation. Function activated by default and which requires an ambience terminal to be connected. |
| | | | Day | - | Monday | Saturday | Sunday | | Choice of day of the week for Legionnaires' Disease Protection function activation. |
| | | | Time | - | 00:00 | 01:00 | 23:00 | | Choice of time of day for Legionnaires' Disease Protection function activation. |
| | | IE4 | Set DHW Temp. | °C | 0 | 65 | 80 | | Set DHW Temperature to be attained in Legionnaires' Disease Protection mode. |
| | | | Time maintained at T. | h | 0 | 1 | 3 | | Length of time DHW temperature is maintained at the set Legionnaires' Disease Protection temperature before automatic deactivation of this function. |
| | Ambient temperature management | IE5 | Min. Dif./Ambient T. to start DHW | °C | 0.0 | 2.0 | 3.0 | 2.7.2 | Maximum difference between the set and ambient temperature to authorise changeover to DHW mode. |
| | | | Max time. | min | 0 | 60 | 180 | | Maximum duration of Heating mode when there is a demand for DHW production. |
| | Valve | IE6 | Valve time | s | 0 | 90 | 600 | 2.7.8 | DHW changeover valve time. Serves to stop the circulation pump during valve changeover. |
| | Circulation pump | IE7 | Stop circ./valve | Yes/No | | Yes | | | Stoppage or operation of the circulation pump during DHW valve changeover. By default, the circulation pump stops and restarts after the time period set in IE6. |
| | | | Post. circul. | s | 0 | 60 | 300 | | Circulation pump operating time after the compressors stop and DHW valve changeover. |
| | | | Pre. circul. | s | 0 | 60 | 300 | | Circulation pump operating time before the compressors start in DHW mode. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| DOMESTIC HOT WATER | Compressors | IE8 | Min. time OFF | min | 0 | 0 | 30 | - | Minimum compressor stoppage time before restarting in DHW. |
| | | | Min. Time ON | min | 2 | 5 | 20 | - | Minimum compressor operating time in DHW production. |
| | | | Stop comp diff. | °C | 0 | 2 | 10 | 2.7.2 | Temperature difference above the set temperature to stop DHW production by the compressors. |
| ELECTRICAL HEATER. | Unavailable | EH0 | | | | | | 2.8 | Screen displayed when the Boiler Substitution function is activated. |
| | Activation | EH1 | Active | Yes/No | | No | | 2.8.1 | Electrical Heater function activation. |
| | Mode / Balance points | EH2 | Emergency only | Emergency only / Back-up+Emerg. | | Emergency only | | 2.8.2 | Choice of Electrical Heater operating mode: Emergency only (default setting) or Back-up + Emergency. |
| | | | Stage 1 Temp. | °C | -30 | 2 | 30 | | In Back-up mode, the outdoor temperature (balance temperature) authorises Stage 1 electrical heating. |
| | | | Stage 2 Temp. | °C | -30 | -3 | 30 | | In Back-up mode, outdoor balance temperature for Stage 2 electrical heating. |
| | Ambient Temp. management | EH3 | Additional Dif. / compressors | °C | -5.0 | -1.0 | 0.0 | | Temperature difference over set ambient temperature to delay electrical heater ON/OFF in relation to the compressors. |
| | Minimum operating time | EH4 | Comp.-> Stage1 | min | -- / 0 | -- / 20 | -- / 90 | | Minimum compressor operating time to authorise Stage 1 to restart, in Back-up mode. This time does not exist (--) in Emergency mode alone. |
| | | | Stage 1 -> 2 | min | 0 | 20 | 90 | | Minimum stage 1 operating time to authorise Stage 2 to start. |
| | Comfort / Economy settings | EH5 | Comf/Eco management | Yes/No | | Yes | | | Screen displayed in Back-up mode. Activation of Electrical Heater Comfort/Eco management in relation to the compressors. |
| | | | ECO <-- --> CONF | % | 0 | 20 | 40 | | Percentage of compressor over-capacity in relation to residence heat losses that determines whether or not the electrical heating stages start. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| ELECTRICAL HEATER | Set outlet water temperature | EH6 | Starting dif. | °C | -5.0 | -3.0 | Stop dif. S2 - 1 | 2.8.2 | Difference between set outlet water temperature below which the electrical heater stages are authorised to start. |
| | | | S2 stop dif. | °C | -5.0 | -1.0 | Stop dif. S1 | | Difference between set outlet water temperature above which Stage 2 is forced to stop. |
| | | | S1 stop dif. | °C | S2 stop dif. | 0.0 | 3.0 | | Difference between set outlet water temperature above Stage 1 is forced to stop. |
| | Max. outlet water temp | EH7 | Max. outlet water Temp control. (70°C) | Yes/No | | Yes | | | Activation of the electrical heater maximum outlet water temperature, at 70°C. |
| BOILER SUB-STITUTION | Unavailable | IR0 | | | | | | 2.9 | Screen displayed when the electrical heater is activated. |
| | Activation | IR1 | Activated | Yes/No | | No | | 2.9.1 | Activation of the Boiler Substitution function. |
| | | | Set boiler inlet temperature | °C | | | | 2.9.2 | Set boiler inlet temperature (considered equal to the **PAC HT** outlet temperature) is displayed when the Boiler Substitution and Boiler Water Law (IR5) are activated. |
| | Balance points | IR2 | Boiler activation Temp. | °C | -30 | 2 | 30 | | Outdoor (balance) temperature below which the boiler is authorised to start. |
| | | | PAC stop Temp. | °C | -30 | -20 | 30 | | Outdoor temperature below which the **PAC HT** is forced to stop. |
| | Ambient temperature management | IR3 | Additional Dif. / compressors | °C | -5.0 | -1.0 | 0.0 | | Difference over the ambient temperature that delays the start/stop of the boiler in relation to the compressors. |
| | | IR4 | Minimum time in demand mode | min | 0 | 30 | 120 | | Minimum time in ambient temperature demand before the boiler is authorised to start. |
| | Boiler water law | IR5 | Water law | Yes/No | | Yes | | | Activation of the Boiler Water Law. |
| | | | Boiler Temp. Delta | °C | 5 | 15 | 30 | | Boiler theoretical temperature Delta. |
| | | | Start dif. | °C | 3 | 5 | 15 | | Temperature difference for restarting the boiler in relation to the set boiler temperature (IR1). |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| INSTALLATION CONFIGURATION | Installation configuration | CI1 | Emitters | Radiators / Under-floor Heating | | Radiators | | 2.5.1 | Configuration of the type of emitters in the installation: Radiators (default setting) or Under-floor Heating. Changing this configuration will automatically alter the water law and ambient temperature management parameters. |
| | | CI2 | Temp. Probe | Integrated / Remote | | Integrated | | 3.8.5 | Type of management of the outdoor temperature probe, integrated in the **PAC HT** (default setting) or remote via the corresponding kit. |
| | Ambience Terminal | CI3 | Connected | Yes/No | | Yes | | 2.4.3 | Activation of the communicating ambience terminal. As a default setting, the **PAC HT** must operate with the terminal as it optimises heating installation operation. |
| | | | Stop/ Set T. dif. | °C | -1.0 | 1.0 | 5.0 | | Difference in relation to the set ambient temperature to stop the compressors. |
| | | | Start/ Set T. dif. | °C | -2.0 | 0.5 | Stop/ Set T. dif. - 0.5 | | Difference in relation to the set ambience temperature to authorise the compressors to start. |
| | Remote ON/OFF input | CI4 | Config | ON / OFF | | ON/OFF / SUMMER/ WINTER | | 2.3.1 | Configuration of the remote ON/OFF input: either actually ON/OFF (same effect as GENERAL OFF in O0) or SUMMER/WINTER (same effect as SUMMER (Heating Off) in O0). |
| | | | NO | NO: Closed=Off (or Summer) / NC: Open=Off (or Summer) | | NO: Closed= OFF (or Summer) | | | Choice of type of switching input - NO: Normally Open or NC: Normally Closed. |
| MAINTENANCE | Appliance info | M1 | Version 5.0 04/02/10 | | | | | - | Version and date of issue of the software programme installed in the regulator. |
| | | | Model | | | | | - | **PAC HT** model: 12-6, 14-7 or 18-9. |
| | Number of compressor(s) start-ups | M2 | Comp.1/ Large | | | | | 3.9.2 | Total number of start-ups of compressor C1 (on its own or in two stage mode). |
| | | | Comp.2/Small | | | | | | Total number of start-ups of compressor C1 (on its own or in two stage mode). |
| | | | Inc. C1+C2 | | | | | | Total number of start-ups of compressors in in two stage mode. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| MAINTENANCE | Number of start-ups and operating hours of the Back-up Heating or the Boiler | M3 | Start-ups | - | | | | - | Number of start-ups of each stage of the Back-up electrical heating or the boiler. |
| | | | Hours | h | | | | - | Number of operating hours of each stage of the electrical heating or the boiler. The display depends on which function is activated. |
| | Analogue inputs | M4 | Outlet T. | °C | | | | 3.6.1 | PAC HT outlet water temperature. |
| | | | Inlet T. | °C | | | | | Inlet water temperature. |
| | | | Outdoor T. | °C | | | | | Instantaneous outdoor temperature. |
| | De-icing | M5 | Battery T. | °C | | | | 3.4.1 | Temperature at the base of the outdoor exchanger. |
| | | | Bat. Start. Lim. T. | °C | | | | | Temperature limit for the battery below which the de-icing countdown starts. |
| | | M6 | Time Battery T.<lim | min | 5 | 50 | 90 | | Time beyond which de-icing by time is launched. |
| | | | Elapsed time | min | | | | | Time already elapsed to launch the de-icing sequence (to be compared with Time Battery T.<lim). |
| | Early de-icing | M7 | Bat/Out C1+C2 | °C | 14.0 | 17.0 | 20.0 | 3.4.2 | Maximum admissible variance between the outdoor temperature and the battery temperature to launch early de-icing, while respecting the Min. Time. |
| | | | Min. Time | min | 10 | 30 | 90 | | Minimum time already elapsed for de-icing by time (M6) before launching early de-icing by Bat/Out. C1+C2. |
| | | | Max. Bat/Out | °C | 16.0 | 20.0 | 22.0 | | Maximum variance between the outdoor temperature and the battery temperature the launch early de-icing forthwith. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| MAINTENANCE | Digital inputs | M8 | Flow Ctrler | Open / Clos. | | | | 3.6.2 | Status of the Flow Controller digital input. |
| | | | Fan | Open / Clos. | | | | | Status of Fan Fault digital input. |
| | | | Interm. HP | Open / Clos. | | | | | Status of Intermediate High Pressure Pressostat digital input. |
| | | M9 | HP Pressostat | Open / Clos. | | | | | Status of High Pressure Pressostat digital input. |
| | | | LP Pressostat | Open / Clos. | | | | | Status of Low Pressure Pressostat digital input. |
| | | | C1 backflow T. | Open / Clos. | | | | | Status of Compressor 1 backflow Thermostat digital input. |
| | | M10 | C2 backflow T. | Open / Clos. | | | | | Status of Compressor 2 backflow Thermostat digital input. |
| | | | Remote ON/OFF | Open / Clos. | | | | | Status of remote ON/OFF (or SUMMER/WINTER) digital input. |
| | | | Phase ctrl. | Open / Clos. | | | | | Status of phase Controller digital input. |
| | | M11 | DHW input | Open / Clos. | | | | | Status of off-peak hours for DHW digital input. |
| | | | De-icing Pres. | Open / Clos. | | | | | Status of de-icing Pressostat digital input. |
| | | | Fault C1/Large | Open / Clos. | | | | | Status of Compressor 1 fault digital input. |
| | | M12 | Fault C2/Small | Open / Clos. | | | | | Status of Compressor 2 fault digital input. |
| | | | Emerg. Switch | Open / Clos. | | | | | Status if Emergency Electrical Heating / Boiler Substitution digital input. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| MAINTENANCE | Digital outputs | M13 | Comp.1 / Large | ON / OFF | | | | 3.6.3 | Status of Compressor 1 digital output. |
| | | | Comp.2 / Small | ON / OFF | | | | | Status of Compressor 2 digital output. |
| | | | Comp. 4w valve | ON / OFF | | | | | Status of Compressors 4 way valve digital output. |
| | | M14 | Circulation pump | ON / OFF | | | | | Status of the Circulation pump digital output. |
| | | | Upper Fan | ON / OFF | | | | | Status of the Upper Fan digital output. |
| | | | Lower Fan | ON / OFF | | | | | Status of the Lower Fan digital output. |
| | | M15 | Oil equal. valve | ON / OFF | | | | | Status of the Oil Equalisation Valve digital output. |
| | | | De-icing valve | ON / OFF | | | | | Status of the De-icing Valve digital output. |
| | | | Sump resist. | ON / OFF | | | | | Status of the Compressors Sump Heating resistance digital output. |
| | | M16 | DHW valve | ON / OFF | | | | | Screen available if the DHW function is activated. Status of the DHW digital output. |
| | | | DHW resistance | ON / OFF | | | | | Status of the DHW Heating resistance digital output. |
| | | M17 | Heater Stage 1 / Boiler | ON / OFF | | | | | Screen available if the Electrical Heating or Boiler Substitution function is activated. Status of the Electrical Heater Stage 1 or the Boiler Start digital output. |
| | | | Heater Stage 2 / Boiler valve | ON / OFF | | | | | Status of the Electrical Heater Stage 2 or the Boiler Valve digital output. |
| | Choice of model | M19 | PAC HT | - | 12-6 | 14-7 | 18-9 | - | Choice of model of **PAC HT**. May be useful in the event of software programme updating or regulator replacement, if the model has been incorrectly inputted the first time the power supply is switched on. |
| | Ambience Terminal communication | M21 | COM. protocol | | | | | - | Display of the various communication parameters between the regulator and the **PAC HT** and the ambience terminal when it is declared in CI3. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| COMPRESSOR MANAGEMENT | Auto / Manual management | CP1 | Single / Two stage | Auto (RECOM-MENDED) / Manual | | Auto (RECOM-MENDED) | | 2.6.3 | Automatic or manual management of the staging of the compressors. It is preferable to leave the compressors in automatic management mode but it is possible to change to manual mode to force the choice of a compressor (which will be started when the **PAC HT** runs through an operating cycle). |
| | | | Manual | - | 1 stage - Comp. 1 | 1 stage - Comp. 2 | 2 stages | | Choice of one compressor on its own (1 stage, compressor 1 or 2) or dual stage (2 stages). In the 2 stages case, it is possible that neither compressor starts if the water and outdoor temperature conditions are inadequate. |
| MANUAL DE-ICING | Activation | D1 | ON / OFF | ON / OFF | | OFF | | 3.4.5 | Activation of manual de-icing. The **PAC HT** must be in GENERAL OFF and there must not be any blocking alarms. In addition, the battery temperature must be below 9°C. |
| | Temperatures | D2 | Start: Bat. T. < 9°C | | | | | | Mandatory condition to be able to launch manual de-icing. |
| | | | End: Bat T. > 14°C | | | | | | End of manual de-icing condition. |
| | | | Battery T. | | | | | | Current Battery temperature. Makes it easier to view the state of progress of the manual de-icing sequence. |
| MANUAL OUTPUTS | General activation | S1 | ON / OFF | ON / OFF | | OFF | | 3.7.1 | Activation of the global Manual Outputs function (does not activate any output). The **PAC HT** has to be in GENERAL OFF and with no de-icing sequence under way. |

| Main Menu MM | Section | Screen Ref. | Parameter | Unit | Min. | Def. | Max. | Ref. § | Description / Note |
|---|---|---|---|---|---|---|---|---|---|
| MANUAL OUTPUTS | Digital output activation | S2 | Circulation pump | ON / OFF | | OFF | | 3.7.2 | Manual activation of the Circulation Pump output. Deactivates the water flow control. |
| | | | Comp. 4w Valve | ON / OFF | | OFF | | 3.7.3 | Manual activation of the Compressors 4 way Valve output. |
| | | | Oil equal. valve | ON / OFF | | OFF | | | Manual activation of the Oil Equalisation Valve output. |
| | | S3 | De-icing valve | ON / OFF | | OFF | | | Manual activation of the De-icing valve output. |
| | | | Sump resist. | ON / OFF | | OFF | | 3.7.4 | Manual activation of the Compressors Sump Resistances output. |
| | | S4 | Upper Fan | ON / OFF | | OFF | | 3.7.5 | Manual activation of the Upper Fan output. |
| | | | Lower Fan | ON / OFF | | OFF | | | Manual activation of the Lower Fan output. |
| | | S5 | DHW valve | ON / OFF | | OFF | | 3.7.6 | Screen available if the DHW function is activated. Manual activation of the DHW Valve output. |
| | | | DHW resistance | ON / OFF | | OFF | | | Manual activation of the DHW Electrical Heating Resistance. |
| | | S6 | Heater Stage 1 | ON / OFF | | OFF | | 3.7.7 | Screen available if the Electrical Heater is activated. Manual activation of the Stage 1 output if the circulation pump has been operating for at least 40 seconds. |
| | | | Heater Stage 2 | ON / OFF | | OFF | | | Manual activation of the Stage 2 output. |
| | | S7 | Boiler | ON / OFF | | OFF | | 3.7.8 | Screen available if the Boiler Substitution function is activated. Manual activation of the Boiler start output. |
| | | | Boiler valve | ON / OFF | | OFF | | | Manual activation of the Boiler Valve output. |
| NEW PASWORD | New password Installation | NI1 | Password | - | 0 | 177 | 999 | 3.11 | New installation password. The password 177 will always be valid. |

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